

FUN 85 TPSNS	Convenient instruction proper to FB-4AJ(K)xx temperature module	FUN 85 TPSNS																																															
<div>Execution control –EN</div> <div><div>85.TPSNS</div><div><div>Tp : Pl : Zn : Yn : SR : WR :</div><div><div>ERR—Parameter error ALM—Sensor line broken</div></div></div></div> <div><table><tr><th>Range</th><th>Y</th><th>HR</th><th>ROR</th><th>DR</th><th>K</th></tr><tr><td rowspan="2">Ope- rand</td><td>Y0 Y255</td><td>R0 R3839</td><td>R5000 R8071</td><td>D0 D3071</td><td></td></tr><tr><td>Tp</td><td></td><td></td><td></td><td>0~1</td></tr><tr><td>Pl</td><td></td><td></td><td></td><td></td><td>0~3</td></tr><tr><td>Zn</td><td></td><td></td><td></td><td></td><td>12, 18, 24</td></tr><tr><td>Yn</td><td>○</td><td></td><td></td><td></td><td></td></tr><tr><td>SR</td><td></td><td>○</td><td>○*</td><td>○</td><td></td></tr><tr><td>WR</td><td></td><td>○</td><td>○*</td><td>○</td><td></td></tr></table></div> <div><div>Note 1: FUN85 is the Convenient instruction dedicated for the multiplexing temperature modules: FB-4AJ(K)xx; where xx may be 12,18,24 ; it means the temperature inputs.</div><div>Note 2: The FB-4AJ(K)xx temperature module can only be installed alone, it can't work together with FB-8AD, FB-2AJ(K)4,FB-2AH(T)4 or FB-6AD modules.</div></div> <div><div>Tp: Type of sensor; =0, K-type thermocouple =1, J-type thermocouple</div><div>P1 : Setting of polarity and span; =0 , 0~10V (Unipolar) =1 , 0~ 5V (Unipolar) =2 , -10~10V (Bipolar) =3 , - 5~ 5V (Bipolar)</div><div>Unipolar: U/B jumper set at U Bipolar : U/B jumper set at B Span : 5V/10V jumper setting</div><div>Zn : Setting of input points for temperature; = 12, 18, 24</div><div>Yn : Starting address of discrete output of this module for multiplexing temperature input; it takes 8 points. When expansion module with discrete output will be installed after the temperature module, the discrete output address of which must be added 8.</div><div>SR : Starting register of the engineering value of temperature measurement; it takes Zn registers.</div><div>WR : Starting of working register for this instruction. It takes 5 registers and can't be repeated in using.</div></div>			Range	Y	HR	ROR	DR	K	Ope- rand	Y0 Y255	R0 R3839	R5000 R8071	D0 D3071		Tp				0~1	Pl					0~3	Zn					12, 18, 24	Yn	○					SR		○	○*	○		WR		○	○*	○	
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<div>Function guide and notifications</div> <div>FB-4AJ(K)xx multiplexing temperature module occupies 8 points of analog input address and 8 points of discrete output address in physical, more detail as followings:</div> <div><div>● FB-4AJxx (where, xx may be 12,18,24) provides 4 points of general purpose analog inputs (1st ~ 4th analog input) and xx points of J-type thermocouple inputs for temperature measurement (With the combination of 5th ~ 8th analog inputs and 8 points of discrete output making upto 24 points of temperature measurement).</div><div>● FB-4AKxx (where, xx may be 12,18,24) provides 4 points of general purpose analog inputs (1st ~ 4th analog input) and xx points of K-type thermocouple inputs for temperature measurement (With the combination of 5th ~ 8th analog inputs and 8 points of discrete output making upto 24 points of temperature measurement)</div><div>● The selection of input span of FB-4AJ(K)xx temperature module can be 5V (500°C) or 10V (1000°C); the input polarity can be set as unipolar (U/B jumper setting at U) or bipolar (U/B jumper setting at B): When setting at 10V(1000°C) and unipolar, the range of measurement is 0°C~750°C/32°F ~ 1382°F (J-type) or 0°C~900°C/32°F ~ 1652°F (K-type) When setting at 5V(500°C) and unipolar, the range of measurement is 0°C~420°C/32°F ~ 788°F (J-type) or 0°C~450°C/32°F ~ 842°F (K-type) When setting at 10V(1000°C) and bipolar, the range of measurement is -200°C~750°C/-328°F ~ 1382°F (J-type) or -200°C~900°C/-328°F ~ 1652°F (K-type) When setting at 5V(500°C) and bipolar, the range of measurement is -200°C~420°C/-328°F ~ 788°F (J-type) or -200°C~450°C/-328°F ~ 842°F (K-type)</div></div> <div><div>● FB-4AJ(K)xx multiplexing temperature module occupies 8 points of analog input address and 8 points of discrete output address in physical; • This kind of temperature module can only be installed alone, it can't work together with FB-8AD, FB-6AD, FB-2AJ(K)4,FB-2AH(T)4 or FB-4A(JK)xx modules. • when expansion module with discrete output will be installed after this kind of module, the discrete output address of which must be added 8.</div><div>● The memory mapping of general purpose analog inputs as follows: Address of 1st analog input is R3840; Address of 2nd analog input is R3841 Address of 3rd analog input is R3842; Address of 4th analog input is R3843</div><div>● If the setting of input polarity is unipolar, the primitive value of general purpose analog input is -2048~2047, so, it may be added with the offset 2048 to convert it to be the range of 0~4095 for later operation.</div><div>● For the selection of thermocouple, K-type thermocouple is recommended.</div><div>● It is recommended to select 0~5V for the span and polarity of input if it meets the requirement.</div><div>● Connect the "FG" terminal with the shielding of thermocouple if it is with for better measurement.</div><div>● The "G⊕" terminal must be connected to the safty earth ground of the power system.</div></div>																																																	

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<div data-bbox="209 329 762 360" style="border: 1px solid black; padding: 2px;">User guide for convenient instruction FUN85</div> <ul style="list-style-type: none"> ● When execution control “EN”=1, this instruction will perform multiplexing temperature measurement and store the primitive value into R3968 (TP0) ...R3991 (TP23) ; the value falls in 0~4095 (unipolar) or -2048 ~2047 (bipolar). And then base on the setting of temperature sensor (Tp), input span and polarity (PI) of the temperature module to scale the primitive values to engineering values and store them into temperature measurement registers (SR+0 as the 1st point, ..., SR+23 as the 24th point) ● When the setting of Tp · PI · Zn comes error, this instruction will not be performed and the output indication “ERR” will be ON. ● When the sensor is K-type thermocouple (it needs FB-4AKxx module): <ol style="list-style-type: none"> 1. As the setting of input span and polarity is 0~10V, if the display value is greater than 900°C or 1700°F, it means the line broken of the thermocouple and the output indication “ALM” will be ON. 2. As the setting of input span and polarity is 0~5V, if the display value is greater than 450°C or 870°F, it means the line broken of the thermocouple and the output indication “ALM” will be ON. 3. As the setting of input span and polarity is -10~10V, if the display value is greater than 900°C or 1700°F, it means the line broken of the thermocouple and the output indication “ALM” will be ON. 4. As the setting of input span and polarity is -5~5V, if the display value is greater than 450°C or 870°F, it means the line broken of the thermocouple and the output indication “ALM” will be ON.. ● When the sensor is J-type thermocouple (it needs FB-4AJxx module): <ol style="list-style-type: none"> 1.As the setting of input span and polarity is 0~10V, if the display value is greater than 900°C or 1700°F, it means the line broken of the thermocouple and the output indication “ALM” will be ON. 2.As the setting of input span and polarity is 0~5V, if the display value is greater than 450°C or 870°F,, it means the line broken of the thermocouple and the output indication “ALM” will be ON. 3.As the setting of input span and polarity is -10~10V, if the display value is greater than 900°C or 1700°F, it means the line broken of the thermocouple and the output indication “ALM” will be ON. 4.As the setting of input span and polarity is -5~5V, if the display value is greater than 450°C or 870°F, it means the line broken of the thermocouple and the output indication “ALM” will be ON. ● SR : Starting register of the engineering value of temperature measurement; it needs Zn registers in total. SR+0 stores the 1st point of temperature value, SR+1 stores the 2nd point of temperature value.... ● WR : Starting of working register for this instruction. It takes 5 registers and can't be repeated in using. The content of register WR+0 and WR+1 indicates the status of the sensor which is line broken or not. Bit definition of WR+0 explained as follows: <ul style="list-style-type: none"> Bit0 =1 indicating that the 1st point of sensor is line broken; ... B15=1 indicating that the 16th point of sensor is line broken. Bit definition of WR+1 explained as follows: <ul style="list-style-type: none"> Bit0 =1 indicating that the 17th point of sensor is line broken; ... B7=1 indicating that the 24th point of sensor is line broken. Registers WR+2~WR+7 are used by this instruction. ● FUN85 can only be used once. ● No matter the FUN85 is placed in main program or in sub-program, and whether the execution control “EN”=0 or 1, this instruction must be executed every scan. 		

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<div data-bbox="177 349 536 383" style="border: 1px solid black; padding: 2px;">Specific registers for FUN85</div> <ul style="list-style-type: none"> ● R3968~R3991: Registers storing the primitive temperature value. R3968 storing the 1st point, R3969 storing the 2nd point, etc. and R3991 storing the 24th point. The value is from 0~4095 (unipolar) or -2048~2047 (bipolar). ● R4000 : Low Byte of R4000 is generated from the system; FUN85 instruction will base on the setting of "temperature sensor (TP)" and "input span and polarity (PI)" to create the default and write it into the low byte of R4000. It is used to determine whether R4000~R4004 needs to be initialized; It is not allowed to change the low byte of R4000 by the user. <ul style="list-style-type: none"> : High Byte of R4000 to tell the times for the average of measurement, which can be set by the user. <ul style="list-style-type: none"> =0, no average; every acquired value is the measured value (default) =1, average of 2 times; the average on the acquired 2 times of values is the measured value. =2, average of 4 times; the average on the acquired 4 times of values is the measured value. =3, average of 8 times; the average on the acquired 8 times of values is the measured value. =4, average of 16 times; the average on the acquired 16 times of values is the measured value. ● R4001 : The factor for linear scaling to calculate the engineering value of K-type thermocouple while in positive temperature; <ul style="list-style-type: none"> when the setting of input span and polarity for K-type thermocouple is 0~10V or -10~10V, the default value is 248. when the setting of input span and polarity for K-type thermocouple is 0~5V or -5~5V, the default value is 124. when the setting of input span and polarity for J-type thermocouple is 0~10V or -10~10V, the default value is 240. when the setting of input span and polarity for J-type thermocouple is 0~5V or -5~5V, the default value is 120. <p style="padding-left: 20px;">The expression for engineering value is as follows:</p> <p style="padding-left: 40px;">Engineering value = (Primitive temperature value × R4001) / 1024 (Unipolar).</p> <p style="padding-left: 40px;">Engineering value = (Primitive temperature value × 2 × R4001) / 1024 (Bipolar).</p> <p>When there is a slight difference in measurement result between the standard meter and the FB-PLC's temperature module, if the user would like to use the value acquired by standard meter for correction, the user can tune the value of R4001 to get a better result in temperature measurement. This register provides fine tuning for positive temperature.</p> ● R4002 : The factor for linear scaling to calculate the engineering value of K-type thermocouple while in negative temperature; <ul style="list-style-type: none"> when the setting of input span and polarity for K-type thermocouple is -10~10V or -5~5V, the default value is 286. when the setting of input span and polarity for J-type thermocouple is -10~10V or -5~5V, the default value is 280. <p style="padding-left: 20px;">The expression for engineering value is as follows:</p> <p style="padding-left: 40px;">Engineering value = (Primitive temperature value × R4002) / 1024 (-5~5V).</p> <p style="padding-left: 40px;">Engineering value = (Primitive temperature value × 2 × R4002) / 1024 (-10~10V).</p> <p>When there is a slight difference in measurement result between the standard meter and the FB-PLC's temperature module, if the user would like to use the value acquired by standard meter for correction, the user can tune the value of R4002 to get a better result in temperature measurement. This register provides fine tuning for negative temperature.</p> ● R4003 : The setting value for line broken detection of thermocouple; <ul style="list-style-type: none"> when the setting of input span and polarity is 0~10V or -10~10V, the default value is 901. when the setting of input span and polarity is 0~5V or -5~5V, the default value is 451. 		

Measuring instruction proper to FB-4AJ(K)xx temperature module

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	<ul style="list-style-type: none"> ● R4004 :Time interval between the measurement points while multiplexing. Which the user can set up. The unit is in mS and the default value is 333, it means it needs 333mS to measure one point of temperature. This means the update rate of the temperature is 2 seconds (333mS×6=1998mS) When the value of R4004 is 166, it means it needs 166mS to measure one point of temperature. The update rate of the temperature is 1 second (166mS×6=996mS) When the value of R4014 is 666, it means it needs 666mS to measure one point of temperature. The update rate of the temperature is 4 seconds (666mS×6=3996mS) When the value of R4014 is 1333, it means it needs 1333mS to measure one point of temperature. The update rate of the temperature is 8 seconds (1333mS×4=7998mS) ● R4009 : Lower byte=1, temperature in Fahrenheit unit (°F) ; =Other values, temperature in Centigrade unit (°C) ● R4010 : Each bit of R4010 to tell the status of the sensor's installation. Bit0=1 means that 1st point of temperature sensor is installed. . . Bit15=1 means that 16th point of temperature sensor is installed. (The default of R4010 is FFFFH) ● R4011 : Each bit of R4011 to tell the status of the sensor's installation. Bit0=1 means that 17th point of temperature sensor is installed. . . Bit7=1 means that 24th point of temperature sensor is installed. (The default of R4011 is FFFFH) ● When the temperature sensor is installed (the corresponding bit of R4010 or R4011 must be 1), the system will perform the line broken detection to the sensor. If there is line broken happened to the sensor, there will have the warning and the line broken value will be displayed. ● When the temperature sensor is not installed (the corresponding bit of R4010 or R4011 must be 0), the system won't perform the line broken detection to the sensor and there will not have the warning; the temperature value will be displayed as 0. ● Depends on the sensor's installation, the ladder program may control the corresponding bit of R4010 and R4011 to tell FUN85 to perform or not to perform the line broken detection. 	
	<div>Program example</div> <p>In following examples, the main unit is FBx-28MC(A), and the FB-4AK24 temperature module is attached ; the setting of the input span and polarity is 0~10V.</p> <div>Program example 1</div> <p>● When M0=ON, to measure the temperature of 1st ~ 24th (Zn=24) point of K-type thermocouple inputs and store the engineering values of measurement into R0~R23; also, store the primitive values into R3968~R3991.</p> <p>● When there is line broken in K-type thermocouple, M1 will be ON and the line broken value of this point will be displayed.</p> <p>● When M0=1, M1000~M1023 tells the status of line broken of corresponding sensor.</p>	

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Program example 2

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