

# DVP-SC

## Logic Controller with Special Pulse Input/Output Function Instruction Sheet

### 1 WARNING

This Instruction Sheet only provides descriptions for electrical specifications, general specifications, installation & wiring, troubleshooting and peripherals. Other detail information about programming and instructions is compatible with SA/SX/SC series; please see PLC Application Manual. For more information about the optional peripherals, please see individual product instruction sheet.

This is an OPEN TYPE PLC. The PLC should be kept in an enclosure away from airborne dust, humidity, electric shock risk and vibration. Also, it is equipped with protective methods such as some special tools or keys to open the enclosure, in order to prevent hazard to users or damage the PLC.

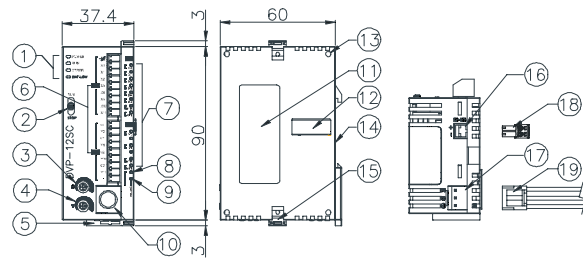
Do NOT connect the AC main circuit power supply to any of the input/output terminals, or it may damage the PLC. Check all the wiring prior to power up. To prevent any electromagnetic noise, make sure the PLC is properly grounded. Do NOT touch terminals when power on.

Battery replacement: please use UL component type: TDRTL-2150/S lithium battery which battery life.

### 2 INTRODUCTION

Thank you for choosing DELTA's PLC DVP series. The DVP-SC series has a 12-points (8 input points + 4 outputs) MPU with powerful instructions (the same instruction sets as SA/SX/SC series) for use. It also has an 8K Steps program memory and high-speed pulse inputs(X10 and X11)/outputs (Y10 and Y11). For high-speed pulse, total bandwidth can up to 130KHz and 100KHz maximum for single input/output. Besides, it also provides instructions of position control and zero point return to use with high-speed pulse output. It could connect all extension units of DVP-SS series for various applications.

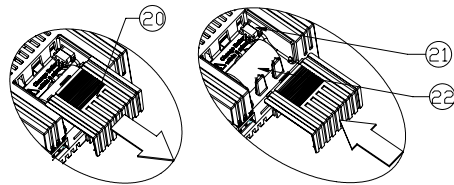
#### 2.1 Product Profile and Outline



Unit: mm

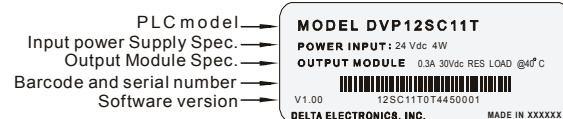
- 1 Status indicators of POWER, RUN and ERROR
- 2 RUN/STOP switch
- 3 VR0: Start-up by M1178/D1178 Corresponding value
- 4 VR1: Start-up by M1179/D1179 Corresponding value
- 5 DIN rail clip
- 6 I/O terminals
- 7 I/O point indicators
- 8 COM1 (RS-232) (Rx) indicator
- 9 COM2 (RS-485) (Tx) indicator
- 10 COM1 (RS-232) port
- 11 Nameplate
- 12 Extension port for wire to connect extension module/unit
- 13 Mounting hole
- 14 DIN rail track (35mm)
- 15 Extension unit clip
- 16 RS-485 communication port (Master/Slave)
- 17 DC Power input
- 18 2 pin removable terminal (standard accessory)
- 19 Power input cable (standard accessory)
- 20 Battery cover
- 21 Battery socket connection
- 22 Battery holder

Battery replacement: Battery replacement must be finished within 3 minutes, or the internal data of the PLC (including the program area, RTC and latched registers) could be lost or destroyed.

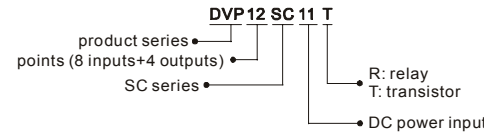


#### 2.2 Model Name Explanation and Peripherals

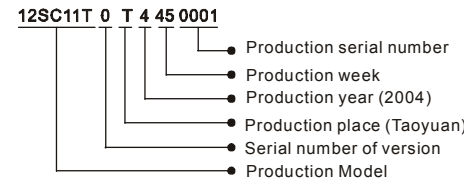
##### Nameplate



##### Model Name



##### Serial Number



##### Peripherals

- DVPHPP02: Handheld Programming panel
- WPLSoft: Windows Ladder Logic Programming Software
- DVPACAB115: 1.5M Cable (HPP ↔ PLC, packaged with DVPHPP02)
- DVPACAB215: 1.5M Cable (PC (DB9+DB25) ↔ PLC)
- DVPACAB230: 3.0M Cable (PC (DB9+DB25) ↔ PLC)
- DVPACAB2A30: 3.0M Cable (PC (DB9) ↔ PLC)

### 3 FUNCTION SPECIFICATIONS

| Items                                 | Specifications   | Remarks   |
|---------------------------------------|--|---|
| Control Method                        | Stored program, cyclic scan system                               |   |
| I/O Processing Method                 | Batch processing method (when END instruction is executed)       | I/O refresh instruction is available  |
| Execution Speed                       | Basic instructions (several us)                                  | Application instructions (10~hundreds us)                                     |
| Program language                      | Instructions + Ladder Logic + SFC                                | Including the Step instructions   |
| Program Capacity                      | 7920 STEPS   | SRAM+ Battery   |
| Instructions                          | 32 Basic sequential instructions (including step instructions)   | 168 Application instructions  |
| X External input relay                | X0~X177 in octal, 128 points in decimal                          | Total 256 points  |
|                                       |  | Correspond to external input point  |
| Y External output relay               | Y0~Y177 in octal, 128 points in decimal                          | Total 256 points  |
|                                       |  | Correspond to external output point   |
| M Auxiliary Relay                     | General M0~M511, 512 points                                      | Total 4096 points   |
|                                       | Latched M512~M999, 488 points                                    |   |
|                                       | Special M2000~M4095, 2096 points                                 |   |
|                                       | M1000~M1999, 1000 points (some are latched)                      | Contacts can switch to On/Off in program                                      |
| T Timer                               | 100ms T0~T199, 200 points  | Total 256 points  |
|                                       | T192~T199 for Subroutine   |   |
|                                       | T250~T255, 6 points Accumulative                                 |   |
|                                       | T240~T245, 6 points Accumulative                                 |   |
| 10ms T200~T239, 40 points             |  |   |
| 1ms T246~T249, 4 points Accumulative  |  |   |
| C Counter                             | 16-bit count up C0~C95, 96 points                                | Total 253 points  |
|                                       | C96~C199, 104 points   |   |
|                                       | 32-bit count up/down C200~C215, 16 points                        |   |
|                                       | C216~C234, 19 points   |   |
|                                       | C235~C244, 1-phase 1 input, 9 inputs                             |   |
|                                       | C243, C245, 1-phase 1 input, 2 points                            |   |
| C246~C249, 1-phase 2 inputs, 3 points |  |   |
| C250, 1-phase 2 inputs, 1 point       |  |   |
| C251~C254, 2-phase 2 inputs, 3 points |  |   |
| S Step point                          | Initial step point S0~S9, 10 points                              | Total 1024 points   |
|                                       | Zero point return S10~S19, 10 points, (use with IST instruction) |   |
|                                       | General S20~S511, 492 points                                     |   |
|                                       | Latched S512~S895, 384 points                                    |   |
| Alarm S896~S1023, 128 points          |  |   |
| T Current value of the timer          | T0~T255, 256 points  | When the timer reaches the preset value, the contact of timer will be On.     |
|                                       |  |   |
| C Current value of the counter        | C0~C199, 16-bit counter, 200 points                              | When the counter reaches the preset value, the contact of counter will be On. |
|                                       | C200~C254, 32-bit counter, 50 points                             |   |
| D Data register                       | General D0~D199, 200 points                                      | Total 5000 points   |
|                                       | Latched D200~D999, 800 points                                    |   |
|                                       | Special D1000~D4999, 3000 points                                 |   |
|                                       | Index D1000~D1999, 1000 points                                   |   |
| Index E0~E3, F0~F3, 8 points          |  |   |
| None File register                    | 0~1599(1600 points)  | Extension register to store data.   |

| Items   | Specifications   | Remarks  |  |
|---|--|--|--|
| N For master control nested loop                  | N0~N7, 8 points  | Control point of master control nested loop  |  |
|   | P For CJ. CALL instructions  | P0~P255, 256 points  | The location point of CJ, CALL.              |
| I Interrupt Service                               | External interrupt   | I001 (X0), I101 (X1), I201 (X2), I301 (X3), I401 (X4), I501 (X5); 6 points (all are rising-edge trigger) | The location pointer of interrupt subroutine |
|   | Time interrupt   | I6 (1ms), I7 (1ms), (01~99ms)  |  |
|   | High-speed counter   | I010, I020, I030, I040, I050, I060, 6 points   |  |
|   | Communication  | I150, 1 point  |  |
| Communication port in series (program read/write) | COM1: only for slave, ASCII/RTU are available, 115200 bps max.<br>COM2: can be Master/Slave, ASCII/RTU are available, 115200 bps max.<br>COM1and COM2 can be used simultaneously   |  |  |
| Potentiometer / RTC                               | MPU built-in 2 points VR / MPU built-in RTC  |  |  |
| High-speed Counter                                | 1-phase 1 input: inputs X10(C243) and X11(C245). Input frequency can up to 100KHz.<br>1-phase 2 inputs: inputs (X10, X11) C250. Input frequency can up to 100KHz.  |  |  |
| Position Control                                  | High-speed pulse outputs Y10 and Y11. Output frequency can up to 100KHz. It can be used as position control of servo drive or step drive when using with position instructions (DDRV1 and DDRVA) and DZRN (zero point return). |  |  |

##### PLC Latched Memory Settings for SC Models

| M Auxiliary Relay | General                       | Latched   | Special auxiliary relay                | Latched   |
|-------------------|-------------------------------|---|--|---|
|                   | M0~M511                       | M512~M999   | M1000~M1999                            | M2000~M4095   |
| T Timer           | 100 ms                        | 10 ms   | 10ms                                   | 1 ms, 100 ms  |
|                   | T0~T199                       | T200~T239   | T240~T245                              | T246~T249, T250~T255  |
| C Counter         | 16-bit count up               |   | 32-bit count up/down                   |   |
|                   | C0~C95                        | C96~C199  | C200~C215                              | C216~C234, C235~C245, C246~C255                                     |
| S Step Relay      | For general S0~S9             | Latched S10~S19   | Special register S20~S511              | Latched S512~S895   |
|                   | It is fixed to be non-latched |   |  | Factory setting is latched Start: D1214 (K512) End: D1215 (K895)    |
| D Register        | General D0~D199               | Latched D200~D999   | Special registers D1000~D1999          | Latched D2000~D4999   |
|                   | Non-latched (fixed)           | Factory setting is latched. Start: D1216 (K200) End: D1217 (K999) | Some are latched and can't be changed. | Factory setting is latched. Start: D1218 (K2000) End: D1219 (K4999) |
| File Register     | K0~K1599 Latched (fixed)      |   |  |   |

##### When switching between power On/Off or MPU RUN/STOP modes:

| Memory Type                          | POWER Off→On  | STOP→RUN  | RUN→STOP            | Clear all M1031 non-latched area | Clear all M1032 latched area | Factory Setting |
|--------------------------------------|---------------|-----------|---------------------|----------------------------------|------------------------------|-----------------|
| Non-latched                          | Clear         | Unchanged | M1033=Off, clear    | Clear                            | Unchanged                    | 0               |
| Latched                              | Unchanged     |           | M1033=On, unchanged | Unchanged                        | Clear                        | 0               |
| Special M, Special D, Index register | Initial value | Unchanged |                     | Unchanged                        |                              | Initial value   |
| File register                        | Unchanged     |           |                     |                                  |                              | 0               |

### 4 ELECTRICAL SPECIFICATIONS

| Item                         | Model | DVP12SC11T  |
|------------------------------|-------|---|
| Power supply voltage         |       | MPU: 24VDC (-15%~+20%) (With DC input reverse polarity protection), Extension Unit: supplied by the MPU   |
| Fuse                         |       | 2A  |
| Power Consumption            |       | 4W MAX  |
| Insulation Resistance        |       | 5 MΩ and above at 500 VDC (Between all inputs / outputs and earth)  |
| Noise Immunity               |       | ESD: 8KV Air Discharge<br>EFT: Power Line: 2KV, Digital I/O: 1KV, Analog & Communication I/O: 250V<br>Damped-Oscillatory Wave: Power Line: 1KV, Digital I/O: 1KV<br>RS: 26MHz~1GHz, 10V/m |
| Grounding                    |       | The diameter of grounding wire cannot be smaller than the wire diameter of terminals L and N (All DVP units should be grounded directly to the ground pole).                              |
| Environment                  |       | Operation: 0°C~55°C (Temperature), 50~95% (Humidity), Pollution degree 2;<br>Storage: -25°C~70°C (Temperature), 5~95% (Humidity)  |
| Vibration / Shock Resistance |       | Standard: IEC1131-2, IEC 68-2-6 (TEST Fc) / IEC1131-2 & IEC 68-2-27 (TEST Ea)   |
| Weight (approx.) (g)         |       | 158   |

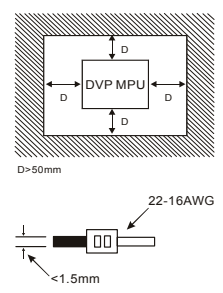
| Approvals            |                         |                       |  |
|----------------------|-------------------------|-----------------------|--|
| Input Specifications |                         | Output Specifications |  |
| Input Type           | Photo coupler Isolation | Output Type           | Transistor   |
| Input Current        | 24VDC 5mA               | Rated current         | 0.3A/1 point @ 40°C (Room Temp.)   |
| Switching Voltage    | Off→On, 16VDC and above | Voltage Specification | 5~30VDC  |
|                      | On→Off, below 14.4VDC   | Max. Inductive load   | 7.2W/24V   |
| Response Time        | X0~X5                   | Output protection     | Internal: None<br>Outside: Rated value according to the load                   |
|                      | X10, X11                | Maximum Loading       | Y0, Y1: 9W / 1 point<br>Y10, Y11: 0.9W / 1 point                               |
|                      |                         | Response Time         | Off→On: <20us<br><1us (Y10, Y11 only)<br>On→Off: <30us<br><1us (Y10, Y11 only) |

**5 MODEL NAME & I/O CONFIGURATION**

| Model      | Power | Input/Output Specification |                                     |             |                              | I/O Configuration |
|------------|-------|----------------------------|-------------------------------------|-------------|------------------------------|-------------------|
|            |       | Input Unit                 |                                     | Output Unit |                              |                   |
|            |       | Points                     | Type                                | Points      | Type                         |                   |
| DVP12SC11T | 24VDC | 6                          | 24VDC Sink/Source X0~X5             | 2           | Transistor Y0, Y1            |                   |
|            |       | 2                          | 24VDC Sink/Source Hi-speed X10, X11 | 2           | Transistor Hi-speed Y10, Y11 |                   |

**6 INSTALLATION & WIRING**

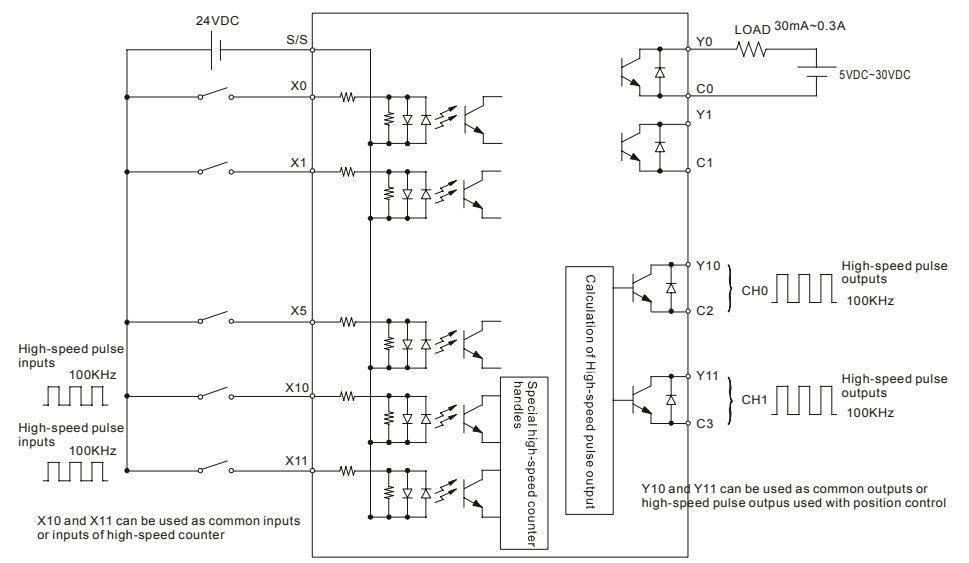
- 6.1 PLC Mounting Arrangements and Wiring Notes**
- When installing the DVP series PLC, make sure that it is installed in an enclosure with sufficient space (as shown on the right) to its surroundings so as to allow heat dissipation.
  - I/O signal wires or power supply should not run through the same multi-wire cable or conduit.
  - Please use 22-16AWG (1.5mm) wiring (either single or multiple core) for I/O wiring terminals. The specification for the terminals is as shown on the right.
  - PLC terminal screws should be tightened to a torque of 1.95 kg-cm (1.7 in-lbs). Use Copper Conductor Only, 60/75 °C



**6.2 Wiring Notes**

DVP-SC Series input power supply is DC input. Please take a note of listed items when operating DVP-SC Series.

**Input/Output Wiring**



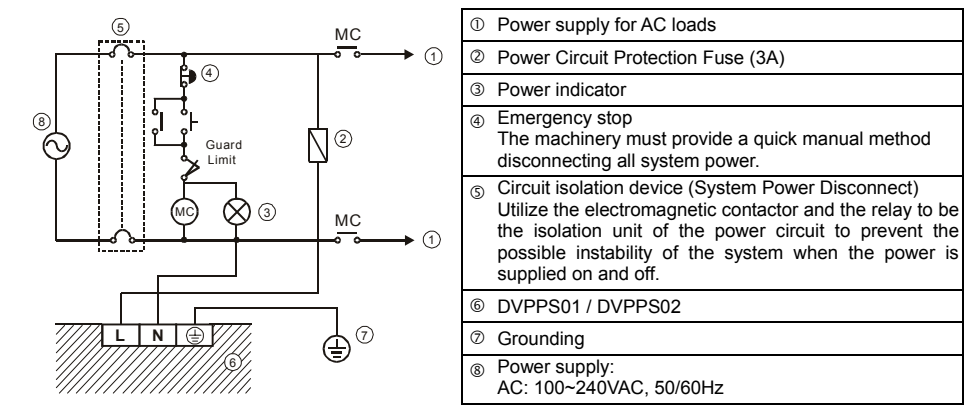
**Power Input Wiring**

- Please make sure the power is at terminals 24VDC and 0V (power range is 20.4VDC~28.8VDC). When voltage is lower than 20.4VDC, PLC will stop operating, all outputs will be Off and ERROR LED will flash continuously.
- If the power-cut time is less than 10ms, the PLC still operates unaffectedly. If the power-cut time is too long or

the power voltage drops, the PLC will stop operating and all the outputs will be Off. Once the power is restored, the PLC will return to operation automatically.

**Safety Wiring**

Since the PLC is used to control numerous devices, motion of either one device could affect the motion of other devices. Therefore the breakdown of a device would consequently be detrimental to the whole auto control system, thus the result is dangerous. Please use the recommended wiring below for the power input (DVPPS01/DVPPS02):



**7 HIGH-SPEED PULSE INPUT FUNCTION**

**Additional high-speed input counters of DVP-SC series**

Additional number and function table

|     | 1-phase 1 input |      |      |      |      |      |      |      |      |      | 1-phase 2 inputs |      |      | A/B phase input |      |      |      |      |      |
|-----|-----------------|------|------|------|------|------|------|------|------|------|------------------|------|------|-----------------|------|------|------|------|------|
|     | C235            | C236 | C237 | C238 | C239 | C240 | C241 | C242 | C243 | C244 | C245             | C246 | C247 | C249            | C250 | C251 | C252 | C254 | C255 |
| X0  | U/D             |      |      |      |      |      | U/R  |      |      |      | U/D              | U    | U    | U               |      | A    | A    | A    |      |
| X1  |                 | U/D  |      |      |      |      | R    |      |      |      | R                | D    | D    | D               |      | B    | B    | B    |      |
| X2  |                 |      | U/D  |      |      |      |      | U/D  |      |      |                  |      | R    | R               |      | R    | R    | R    |      |
| X3  |                 |      |      | U/D  |      |      | R    |      | S    |      |                  |      |      | S               |      |      |      | S    |      |
| X4  |                 |      |      |      | U/D  |      |      |      |      |      |                  |      |      |                 |      |      |      |      |      |
| X5  |                 |      |      |      |      | U/D  |      |      |      |      |                  |      |      |                 |      |      |      |      |      |
| X10 |                 |      |      |      |      |      |      |      | U/D  |      |                  |      |      |                 | U    |      |      |      | A    |
| X11 |                 |      |      |      |      |      |      |      |      | U/D  |                  |      |      |                 | D    |      |      |      | B    |

Additional high-speed counters C243, C245, C250 and C255 correspond to count input X10 and X11. The counters correspond to X0~X5 are the same as SA/SX series.

**8 TRIAL RUN**

**Power Indicator**

The "POWER" LED at the front of the MPU or the Extension Units will be lit (in green) if the power is on. If the indicator is not ON or ERROR LED is blinking swiftly when the MPU is powered up, it means that the +24V power supply of the PLC is insufficient, i.e. the 24V DC power supply of the PLC is overloaded. It is thus necessary to remove the wiring on terminals +24V and 24G, and to use a 24VDC power supply instead.

**Low Battery Voltage Indicator**

There is also a "BAT.LOW" LED at the front of the MPU. When the LED is on, it indicates that the battery voltage is not enough. Please change the batter (within 3 minutes) as soon as possible; otherwise the user programs and the data in latched area may be lost.

**Preparation**

- Prior to applying power, please verify that the power lines and the input/output wiring are correct. And be advised not to supply AC110V or AC220V into the I/O terminals, or it might short-circuit the wiring and would cause direct damage to the PLC.
- After using the peripheral devices to write the program into the MPU and that the ERROR LED of the MPU is not on, it means that the program in use is legitimate, and it is now waiting for the user to give the RUN instruction.
- Use HPP to execute the forced On/Off test of the output contact.

**Operation & Test**

If the "ERROR" LED of the MPU is not blinking, use RUN/STOP switch or the peripheral devices (HPP or WPLSoft) to give the RUN instruction, and the RUN indicator will then be on. If the "RUN" LED is not on, it indicates that there is no program inside the PLC. HPP could be utilized to monitor the settings and the registered values of the timer (T), the counter (C) and the data register (D) during operation. If the ERROR LED is on (but not blinking), it means that the setting of the user's program has exceeded the preset time-out limit. At this case, please turn the PLC RUN/STOP switch to STOP, and find out the address of the time-out program by special data register D1008. "WDT" instruction can be used to solve the problem.

**PLC Input/Output Response Time**

The total response time from the input signal to the output operation is calculated as follows:

Reaction Time = input delay time + program scan time + output delay time

|                   |  |
|-------------------|--|
| Input delay time  | Factory setting: 10ms. Please refer to the usage of special registers D1020~D1021. |
| Program scan time | Please refer to special register D1010 for detail.                                 |
| Output delay time | Transistor module: 20~30us.  |

**Basic Instructions and Application Instructions of the PLC:**

- The basic instructions and the application instructions of the MPU of this series are totally applicable to the DELTA DVP-PLC SA/SX/SC Series MPU. Refer to the DELTA PLC Application Manual for relevant basic instructions and application instructions.
- All Delta DVP-PLC series can use DVPHPP handheld programming panel and the WPLSoft (Windows version) to edit program.

**9 TROUBLESHOOTING**

Judge the errors by the indicators on the front panel. When errors occurred on DVP PLC, please check:

**"POWER" LED**

There is a "POWER" LED at the front of the MPU. When the MPU powered on, the green LED light will be on. If the indicator is not on after the input power to MPU is normal, it indicates that the PLC is out of order. Please have this machine replaced or repaired at a dealer near you.

**PLC "RUN" LED**

Identify the status of the PLC. When the PLC is in operation, this light will be on, and users could thus use HPP or the editing program of the ladder diagram to send instructions to PLC for "RUN" or "STOP".

**"ERROR" LED**

If incorrect programs are input to the MPU, or the instructions and the components exceed the setting range, the indicator will blink. In this case, the user should check both the error codes saved in the MPU data register D1004 and the Error Code to correct the programs. The address that the error occurs will be stored in data register D1137 (the address saved in D1137 is invalid in case of common loop error).

When the ERROR LED is on (not blinking), users should make a judgment from the special relay M1008 of the MPU. If it is On, it indicates that the execution time of the program loop has exceeded the time-out setting (set by D1000). Please turn the PLC RUN/STOP switch to STOP, and find out the address of the time-out program by special data register D1008. "WDT" instruction can be used to solve the problem. Once program modification is completed, user can re-download the program of PLC and the ERROR LED will be off. If the ERROR LED is still keep on, please turn off the power and check if there's any noise or any conductive invader inside the PLC.

**"BAT.LOW" LED**

When the battery voltage is low, the "BAT.LOW" LED will be on, and the battery should be replaced as soon as possible; otherwise the user program and the data in latched area will be lost. (On the unplugged PLC, please change the battery within 3 minutes to retain the PLC internal user programs and data). Choose lithium battery TDRTL-2150/S. Please refer to the following table for battery life information.

Battery life :

|                  |   |    |    |    |
|------------------|---|----|----|----|
| Temperature((°C) | 0 | 25 | 50 | 70 |
| Life(Years)      | 9 | 8  | 6  | 5  |

Precision of calendar timer :

- At 0°C/32°F, less than -117 seconds error per month.
- At 25°C/77°F, less than 52 seconds error per month.
- At 55°C/131°F, less than -132 seconds error per month.

**"Input" LED**

The On/Off signals of the input point could be displayed through the "Input" LED, or the status of the input point could be monitored through the device monitoring function of HPP. When input signal is activated, this LED will light. Therefore, if there is any malfunction, please check it with HPP, indicators and input signals. Especially when using electrical switch with significant leakage current, it often causes unexpected result.

**"Output" LED**

Output LED indicates the output signals are on or off. Please check the following items when the LED On/Off indication does not correspond to the instructions: 1. Output contacts may be melted and stuck together due to a short circuit or overload current. 2. Check wiring and verify that the screws are tight.

**"RS-232, RS-485" LED**

"RS-232" LED will light when RS-232 is receiving data and "RS-485" LED will light when RS-485 is transferring data.