PLC编程简介

1、PLC的基本概念

早期的可编程控制器称作可编程逻辑控制器(Programmable Logic Controller,PLC)，它主要用来代替继电器实现逻辑控制。随着技术的发展，这种采用微型计算机技术的工业控制装置的功能已经大大超过了逻辑控制的范围，因此，今天这种装置称作可编程控制器，简称PC。但是为了避免与个人计算机(Personal Computer)的简称混淆，所以将可编程序控制器简称PLC,plc自1966年美国数据设备公司（DEC）研制出现，现行美国，日本，德国的可编程序控制器质量优良，功能强大。 资料来源 360毕业设计网 www.bysj360.com

2、PLC的基本结构

PLC实质是一种专用于工业控制的计算机，其硬件结构基本上与微型计算机相同，基本构成为： a、电源 PLC的电源在整个系统中起着十分重要的作用。如果没有一个良好的、可靠的电源系统是无法正常工作的，因此PLC的制造商对电源的设计和制造也十分重视。一般交流电压波动在+10%(+15%)范围内，可以不采取其它措施而将PLC直接连接到交流电网上去 b. 中央处理单元(CPU) 中央处理单元(CPU)是PLC的控制中枢。它按照PLC系统程序赋予的功能接收并存储从编程器键入的用户程序和数据；检查电源、存储器、I/O以及警戒定时器的状态，并能诊断用户程序中的语法错误。当PLC投入运行时，首先它以扫描的方式接收现场各输入装置的状态和数据,并分别存入I/O映象区,然后从用户程序存储器中逐条读取用户程序，经过命令解释后按指令的规定执行逻辑或算数运算的结果送入I/O映象区或数据寄存器内。等所有的用户程序执行完毕之后，最后将I/O映象区的各输出状态或输出寄存器内的数据传送到相应的输出装置，如此循环运行，直到停止运行。 为了进一步提高PLC的可靠性，近年来对大型PLC还采用双CPU构成冗余系统，或采用三CPU的表决式系统。这样，即使某个CPU出现故障，整个系统仍能正常运行。 c、存储器 存放系统软件的存储器称为系统程序存储器。 存放应用软件的存储器称为用户程序存储器。 d、输入输出接口电路 1、现场输入接口电路由光耦合电路和微机的输入接口电路，作用是PLC与现场控制的接口界面的输入通道。2、现场输出接口电路由输出数据寄存器、选通电路和中断请求电路集成，作用PLC通过现场输出接口电路向现场的执行部件输出相应的控制信号。 e、功能模块 如计数、定位等功能模块 f、通信模块 如以太网、RS485、Profibus-DP通讯模块等

3、PLC的工作原理

一. 扫描技术 当PLC投入运行后，其工作过程一般分为三个阶段，即输入采样、用户程序执行和输出刷新三个阶段。完成上述三个阶段称作一个扫描周期。在整个运行期间,PLC的CPU以一定的扫描速度重复执行上述三个阶段。 (一) 输入采样阶段 在输入采样阶段，PLC以扫描方式依次地读入所有输入状态和数据，并将它们存入I/O映象区中的相应得单元内。输入采样结束后，转入用户程序执行和输出刷新阶段。在这两个阶段中，即使输入状态和数据发生变化，I/O映象区中的相应单元的状态和数据也不会改变。因此，如果输入是脉冲信号，则该脉冲信号的宽度

必须大于一个扫描周期，才能保证在任何情况下，该输入均能被读入。　　(二)用户程序执行阶段　　在用户程序执行阶段，PLC总是按由上而下的顺序依次地扫描用户程序(梯形图)。在扫描每一条梯形图时，又总是先扫描梯形图左边的由各触点构成的控制线路，并按先左后右、先上后下的顺序对由触点构成的控制线路进行逻辑运算，然后根据逻辑运算的结果，刷新该逻辑线圈在系统RAM存储区中对应位的状态；或者刷新该输出线圈在I/O映象区中对应位的状态；或者确定是否要执行该梯形图所规定的特殊功能指令。　　即，在用户程序执行过程中，只有输入点在I/O映象区内的状态和数据不会发生变化，而其他输出点和软设备在I/O映象区或系统RAM存储区内的状态和数据都有可能发生变化，而且排在上面的梯形图，其程序执行结果会对排在下面的凡是用到这些线圈或数据的梯形图起作用；相反，排在下面的梯形图，其被刷新的逻辑线圈的状态或数据只能到下一个扫描周期才能对排在其上面的程序起作用。　　在程序执行的过程中如果使用立即I/O指令则可以直接存取I/O点。即使用I/O指令的话，输入过程影像寄存器的值不会被更新，程序直接从I/O模块取值，输出过程影像寄存器会被立即更新，这跟立即输入有些区别。　　(三)输出刷新阶段　　当扫描用户程序结束后，PLC就进入输出刷新阶段。在此期间，CPU按照I/O映象区内对应的状态和数据刷新所有的输出锁存电路，再经输出电路驱动相应的外设。这时，才是PLC的真正输出。

4、PLC内部运作方式

虽然PLC所使用之阶梯图程式中往往使用到许多继电器、计时器与计数器等名称，但PLC内部并非实体上具有这些硬件，而是以内存与程式编程方式做逻辑控制编辑，并借由输出元件连接外部机械装置做实体控制。因此能大大减少控制器所需之硬件空间。实际上PLC执行阶梯图程式的运作方式是逐行的先将阶梯图程式码以扫描方式读入CPU 中并最后执行控制运作。在整个的扫描过程包括三大步骤，“输入状态检查”、“程式执行”、“输出状态更新”说明如下：　　步骤一“输入状态检查”：PLC首先检查输入端元件所连接之各点开关或传感器状态（1 或0 代表开或关），并将其状态写入内存中对应之位置Xn。步骤二“程式执行”：将阶梯图程式逐行取入CPU中运算，若程式执行中需要输入接点状态，CPU直接自内存中查询取出。输出线圈之运算结果则存入内存中对应之位置，暂不反应至输出端Yn。步骤三“输出状态更新”：将步骤二中之输出状态更新至PLC输出部接点，并且重回步骤一。 此三步骤称为PLC之扫描周期，而完成所需的时间称为PLC 之反应时间，PLC 输入讯号之时间若小于此反应时间，则有误读的可能性。每次程式执行后与下一次程式执行前，输出与输入状态会被更新一次，因此称此种运作方式为输出输入端“程式结束再生”。

PLC内部运作架构

5、plc目前的主要品牌

美国AB，ABB，松下，西门子，汇川，三菱，欧姆龙，台达，富士，施耐德，信捷等

编辑本段三菱PLC

三菱PLC英文名又称：Mitsubishi Power Line Communication，是三菱电机在大连生产的主力产品。 三菱PLC在中国市场常见的有以下型号： FR-FX1N FR-FX1S FR-FX2N FR-FX3U FR-FX2NC FR-A FR-Q

三菱PLC产品系列

FX1S系列:三菱PLC是一种集成型小型单元式PLC。且具有完整的性能和通讯功能等扩展性。如果考虑安装空间和成本是一种理想的选择。　　FX1N系列:是三菱电机推出的功能强大的普及型PLC。具有扩展输入输出，模拟量控制和通讯、链接功能等扩展性。是一款广泛应用于一般的顺序控制三菱PLC。　　FX2N系列:是三菱PLC是FX家族中最先进的系列。具有高速处理及可扩展大量满足单个需要的特殊功能模块等特点，为工厂自动化应用提供最大的灵活性和控制能力。　　FX3U:是三菱电机公司新近推出的新型第三代三菱PLC,可能称得上是小型至尊产品。基本性能大幅提升，晶体管输出型的基本单元内置了3轴独立最高100kHz的定位功能，并且增加了新的定位指令，从而使得定位控制功能更加强大，使用更为方便。　　FX1NC FX2NCFX3UC三菱PLC:在保持了原有强大功能的基础上实现了极为可观的规模缩小I/O型接线接口降低了接线成本，并大大节省了时间。　　Q系列三菱PLC:三菱机公司推出的大型PLC,CPU类型有基本型CPU，高性能型CPU，过程控制CPU,运动控制CPU,冗余CPU等。可以满足各种复杂的控制需求。三菱电机中国事业的快速发展，为了更好地满足国内用户对三菱PLC，Q系列产品高性能、低成本的要求，三菱电机自动化特推出经济型QUTESET型三菱PLC，即一款以自带64点高密度混合单元的5槽Q00JCOUSET；另一款自带2块16点开关量输入及2块16点开关量输出的8槽Q00JCPU-S8SET，其性能指标与Q00J完全兼容，也完全支持GX-Developer等软件，故具有极佳的性价比。　　A系列三菱PLC: 使用三菱专用顺控芯片（MSP），速度/指令可媲美大型三菱PLC;A2ASCPU支持32个PID回路。而QnASCPU的回路数目无限制，可随内存容量的大小而改变；程序容量由8K步至124K步，如使用存储器卡，QnASCPU则内存量可扩充到2M字节；有多种特殊模块可选择，包括网络，定位控制，高速计数，温度控制等模块。

三菱PLC的主要特点

① 结构灵活

不受环境的限制，有电即可组建网络，同时可以灵活扩展接入端口数量，使资源保持较高的利用率，在移动性方面可与WLAN媲美。

② 传输质量高、速度快、带宽稳定

可以很平顺的在线观赏DVD影片,它所提供的14Mbps带宽可以为很多应用平台提供保证。最新的电力线标准HomePlug AV传输速度已经达到了200Mbps；为了确保QoS，HomePlug AV采用了时分多路访问（TDMA）与带有冲突检测机能的载体侦听多路访问（CSMA）协议，两者结合，能够很好地传输流媒体。

③ 范围广

无所不在的电力线网络也是这种技术的优势。虽然无线网络可以做到不破墙，但对于高层建筑来说，其必需布设N多个AP才能满足需求，而且同样不能避面信号盲区的存在。而电力线是最基础的网络，它的规模之大，是其他任何网络无法比拟的。由此，运营商就可以轻松地把这种网络接入服务渗透到每一处有电力线的地方。这一技术一旦全面进入商业化阶段，将给互联网普及带来极大的发展空间。终端用户只需要插上电力猫，就可以实现因特网接入，电视频道接收节目，打电话或者是可视电话。

④ 低成本

充分利用现有的低压配电网络基础设施，无需任何布线，节约了资源。无需挖

沟和穿墙打洞，避免了对建筑物、公用设施、家庭装潢的破坏，同时也节省了人力。相对传统的组网技术，PLC成本更低，工期短，可扩展性和可管理性更强。目前国内已开通电力宽带上网的地方，其包月使用费用一般为50-80元/月左右，这样的价格和很多地方的ADSL包月相持平。

⑤ 适用面广

PLC作为利用电力线组网的一种接入技术，提供宽带网络“最后一公里”的解决方案，广泛适用于居民小区，酒店，办公区，监控安防等领域。它是利用电力线作为通信载体，使得PLC具有极大的便捷性，只要在房间任何有电源插座的地方，不用拨号，就立即可享受4.5~45Mbps的高速网络接入，来浏览网页、拨打电话，和观看在线电影，从而实现集数据、语音、视频，以及电力于一体的“四网合一”。

PLC programmable profile

1 the basic concept, the PLC

Early Programmable Controller called Programmable Logic Controller (PLC Programmable Controller, questions), it is mainly used to replace relay realize Logic control. With the development of technology, this kind of using microcomputer technology, industrial control device functionality is greatly exceed the logic control the scope, therefore, today this device called the programmable controller, or PC. But in order to avoid Personal Computer (Personal Computer), so will the abbreviation of confusion as PLC programmable controller, since 1966 PLC us data equipment company (DEC), and the current U.S. research appears, Japan, Germany's programmable controller quality is fine, the function is strong.

2, the basic structure of PLC

PLC is essentially a special in industrial control computer, its hardware structure with microcomputer is same, basically for: a, basic composition of the power supply in the whole system of PLC plays a very important role. If have no a good and reliable power supply system is not work properly, so the manufacturers of the power of PLC design and manufacturing has paid much attention to. In general ac voltage fluctuation + 10% (+ 15%) range, can not take other measures and will PLC is connected directly to the exchange network up b. central processing unit (CPU) the central processing unit (CPU) is the PLC control central. It according to the function of PLC system program gives receives and storage from programmer type of user programs and data; Check the power, storage, I/O and cordoned-off timer state, and can the syntax error diagnosis user programs. When PLC is put into operation, it first to scan all the way of receiving site condition and data input device, and separately deposited in the I/O image area, and then from the user program memory read the user program, through detailed explanation according to instructions commands after regulations logic or count operation results into the I/O image area or data register inside. All the user program execution after completion, the I/O image of each output state or output registers transfer data to the corresponding within the output device, so circulates run, until it stops running. In order to further improve the reliability of PLC in recent years, for large PLC also adopt double CPU constitute a redundant system, or adopt three CPU voting type system. So, even if a CPU malfunction, the whole system can still normal operation. C, memory storage system software of memory called system program memory. Storage application software of memory called the user program memory. D, input/output interface circuit 1, field input interface circuit by optical coupling circuit and the input interface circuit, microcomputer PLC and on-the-spot control function is the UI input. 2, field output interface circuit output data registers, chosen by electricity road and interrupt request circuit integration, the function of PLC output interface circuit through the site to site perform component of output

corresponding control signals. E, function module as counting, positioning, and other function module f, communication module as Ethernet, RS485, profibus-dp communication module, etc

3. PLC principle of work

A. Scanning technique when PLC after the port is put into operation, its working process generally divided into three stages, namely input sampling, the user program execution and output refresh three stages. Complete the above three stages as a scan cycle. In the whole operation period, PLC CPU with certain scanning speed repeating the above three stages.

(1) input sampling stage in input sampling stage with scanning mode in turn, PLC read into all input states and data, and will they deposited in the I/O image area within the relevant units. Input sampling ended, turn to the user program execution and output refresh stage. In these two stages, even if the input status and data changes, I/O image area of state and the relevant unit data also won't change. Therefore, if the input is the pulse signal, the pulse signal widths must be bigger than a scan cycle, can ensure that in any case, this input all can be read.

(2) the user program performance stage at the user program execution phase, PLC always press down the order of sequence scanning the user program (ladder diagram). In a scanning each a ladder diagram, and always first scan ladder-diagram left by all the contacts constitute control circuits, and press first left, after the first under the order of the control by contacts constitute the lines logic operations, and then based on the arithmetic logic result, refresh this logic coil in system RAM storage area in corresponding a state; Or refresh the output coil in the I/O image area in corresponding position state; Or to determine whether to enforce the ladder-diagram prescribed by the special function instructions. Namely, the user program execution process, only input points in the I/O image zone state and data will not change, and other output points and soft equipment in the I/O image area or system RAM storage area of state and data is likely to change, and row at top of the ladder diagram, its program to implement results of row who will the next with these coils or data ladder diagram matters; Instead, row below the ladder diagram, the logic of the coil set state or data only to the next in line to scan cycle it plays a role in the program. In the process of program execution if used immediately I/O instructions can be direct access I/O points. Namely, use I/O instructions of words, input process image registers value is not update, program directly from the I/O modules, output value will be immediately image registers with renewals this input some difference immediately.

(3) output refresh stage when scanning the user program ended, PLC came into output refresh stage. During this period, the CPU according to the I/O image area of state and the corresponding data refresh all the output latch circuit, then after output circuit driver corresponding peripherals. At this moment, is the real output of PLC.

4, PLC internal operation mode

Although the use of ladder diagram of PLC program is usually used to many relays, timer and counter, but such names on internal not entity with PLC, but these hardware in the memory and program program mode, and doing logic control editing by output elements are connected by external mechanical devices do entity control. So can greatly decrease the controller required hardware space. In fact PLC executive ladder diagram program mode of operation is will ladder diagram works by first code scanning mode read in the execution of the CPU control operation. In whole the scanning process includes three steps, "input state examination", "the program execution" and "update" that the output state as follows: step one "input states check" : PLC first check the input devices connected to each point switch or sensor state (1 or 0 (on or off), and its status in the memory of the corresponding position write Xn. Step 2 "code-execution" : will ladder diagram programs perform take into the CPU, if the program execution in operation need input contact state, direct from the memory inquires CPU removed. The operation result is output coil deposit in corresponding position, memory does not react to the output transient Yn. Step 3 "output status update" : will the output state step 2 update to the PLC output department contact, and back to step 1. Of the three steps called PLC, and completed scanning cycle the time needed for the reaction time, called PLC PLC input signal if less than this time reaction time, are misreading of possibility. After the program execution with the next time before the program execution, output and input state will be updated once, so say such works as output input "renewable" ended the program.

PLC internal operation architecture

5, PLC current main brand

American AB, ABB, panasonic, Siemens, HuiChuan, mitsubishi, omron, Taiwan), Fuji, schneider, letter nimble, etc

Edit this paragraph mitsubishi PLC

Mitsubishi PLC English name say again: Mitsubishi Power Line Communication, is in dalian Mitsubishi electric production of main products. Mitsubishi PLC in the Chinese market common have the following models: FR - FX1N FR - FX1S FR - FX2N FR - FX3U FR - FX2NC FR - A FR - Q

Mitsubishi PLC products series

FX1S series: mitsubishi PLC is a kind of collect molding small cellular PLC. And with complete performance and communication function etc extensibility. If considering installing space and cost is a kind of ideal choice. Mitsubishi motors FX1N series: is launched powerful auv PLC. Has expanded input/output, analogue control and communication, link function etc extensibility. Is in a widely used in general sequence control mitsubishi PLC. FX2N series: mitsubishi PLC is the family is the most advanced in FX series. A high-speed processing and extensible large meet the special function module individual needs characteristics, such as factory automation application provides maximum flexibility and control ability. FX3U: mitsubishi electric company recently introduced into is the new third-generation mitsubishi PLC, may be called small supreme products. Basic

performance increases, the basic unit output type transistor built-in 3 axis positioning function of independent supreme 100 KHZ, and increased new positioning instruction, thus make the positioning control function more powerful, use more convenient. FX1NC FX2NCFX3UC mitsubishi PLC: in kept the original based on the strong function realized the extremely considerable scaled-down I/O type wiring interface reduced wiring costs, and save time. Q series of mitsubishi PLC: mitsubishi machine company launched large-scale PLC, CPU type has the basic CPU, high-performance type CPU, process control CPU, motion control CPU, redundancy CPU, etc. Can meet various complicated control requirements. Mitsubishi motors China business of rapid development, in order to better satisfy the users for mitsubishi PLC, Q series products high performance and low cost requirements, mitsubishi electric automation promote economic QUTESET type, i.e. a paragraph of mitsubishi PLC to bring 64 points of high-density mixing unit 5 slot Q00JCOUSET; Another kind of bringing the two pieces of 16 point switch input and the two pieces of 16 point switching output Q00JCPU - 8 slot S8SET, its performance index Q00J fully compatible with GX - and fully support Developer software, it has excellent ratio. A series of mitsubishi PLC: use the mitsubishi special sequence control chip (MSP), speed/commands comparable with large mitsubishi PLC; A2ASCPU support 32 PID circuits. And the number of QnASCPU unrestricted and with the loop size of memory capacity change; Program 124K by 8K steps to capacity step, such as the use of memory card, while QnASCPU 2M is extended to the stock in bytes); A variety of special module can be options, including network, positioning control, high-speed count, the temperature control module.

Mitsubishi PLC main characteristics

(1) structure flexible

Do not suffer environmental restrictions, have electricity can form network, but can be flexible expand access port number, make resources keep higher utilization, in mobility and wireless local-area network (WLAN in comparable.

(2) transmission quality, speed and bandwidth is stable

Can very smooth online watch a DVD of the film, and it can be provided for many applications 14Mbps bandwidth platform provides guarantee. HomePlug AV latest powerline standard transmission rate has reached 200Mbps; In order to ensure HomePlug AV adopted, QoS at road access (TDMA) and the carrier of collision detection function with protected reliably against detective multiple access (CSMA) agreement, both union, perfectly transmission flow media.

(3) range

Ubiquitous electric network is the advantage of this technology. Although the wireless network can do not break it, but for high-rise building, the necessary to satisfy layont N several AP demand, and also cannot avoid blind face the existence of signal. And power lines is the most fundamental of the network, it's scale, is any other network and incomparable. Thus, operators can easily put the Internet access service to infiltrate every place has the power of place. This technology once completely into the commercialization phase, will give the

popularization of the Internet brings the enormous development space. End user just need to plug in electric cats, can realize the Internet access, the TV channel, receiving programs or video phone call.

(4) low cost

Make full use of the existing low voltage distribution network infrastructure, no wiring, economize resources. No dug trenches and wear wall make hole, avoids to buildings, public facilities, and the family decoration destruction, while also save manpower. Relative to traditional networking technology, PLC cheaper, short construction period, scalability and manageability stronger. At present domestic has opened the electric power broadband Internet access, the month where for 50 - general use cost around $80 / month, so that price and many places of ADSL month phase flat.

(5) widely applicable

PLC as a power line networking using technology that provides broadband access network "last mile" solutions, widely used in residential area, hotel, office, monitoring security, etc. It is to use power lines as the communication carrier, makes great convenience of PLC in the room, if any, where power sockets immediately without dial-up, can enjoy 4.5 ~ 45Mbps high-speed Internet access, come to browse the web, call, and watch online movies, so as to realize the set data, voice, video, and power in one of the "four nets oneness.