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A SERCOS NETWORK BASED MODULAR MOTION SOLUTION for SEMICONDUCTOR & FPD EQUIPMENTS

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Abstract: Recently, the field of semiconductor and FPD (Flat Panel Display) equipments has been the major application area of high precision servo systems. The requirements of this market are the PC-based motion control, multi-axis control, and the network based solution to reduce the installation, set-up and maintenance cost. In this paper, we presents a SERCOS network based modular motion solution (MMC-II and CSDM) which is recently adopted in OLB (Outer Lead Bonding) machine for FPD manufacturing equipments. This motion solution offers outstanding scalability and cost advantages through SERCOS network capability and modular servo drives with common DC bus configuration.

Keywords: FPD equipments, SERCOS, PC-based control, Multi-axis, Modular Servo Drives

1. INTRODUCTION

Nowadays, the demand for the high performance motion controller and servo drive system has been largely increased in general motion control market because the motion control part of the system has become more important than the other parts of total automation system. Many recent general motion control applications require the functionalities and feature sets which were unique requirements only for CNC or Robotics applications previously.
Especially, FPD equipments have created one of the fastest growing high performance motion market in Korea in the last 2~3 years. The requirements of this market include the PC-based motion control, the multi-axis control, and the network based solution to reduce the installation, set-up, and maintenance cost.
In this paper, we present SERCOS network based modular motion solution which satisfies performance requirements and cost requirements of semiconductor and FPD equipments. This solution consists of PC-based motion controller (SERCOS MMC-II) which can control maximum 24 axes simultaneously and compact modular servo drives (CSDM) which have common DC bus configuration. Also, we will present application example of this solution on OLB machine for FPD manufacturing.

2. SERCOS MMC-II

The industrial FA controller has been changed from the conventional dedicated type to the universal controller. As a result, the motion controller is being changed to the PC-based open-architecture type. The MMC-II board is also designed as the open-architecture PC-based PCI slot type which can be installed in the FA-Computer and general PC for the motion control regardless of the motor type. Therefore, the MMC-II is very compact and it can be effectively applicable to various motion control functions.

The MMC-II supporting SERCOS optical communication network allows easy connection of systems by using its SERCOS ring, so it can save the wiring cost. The maximum control axes are 24 axes and dual port RAM provides high speed data communication.
This motion controller is the most suitable for the high precision equipment because of minimized noise interference, fast response time, and high accuracy due to the optical communication. Figure 1 shows the MMC-II outline. Also, table 1 shows the MMC-II main features.

Fig. 1. MMC-II Outline

Table 1. MMC-II Main Features

CPU: 32-bit DSP TMS320VC33 150MHz
PCI Interface: PCI Bus 2.1
SERCOS baud rate: 4/8Mbps
On Line Data Monitoring
Support Additional User I/O
Various motion control: PTP,CP,ARC,SP Line and etc.
Support various development environment: Win98/2000/NT/XP, Visual C++, VB, Delphi, BC
User friendly GUI and various library functions

3. CSDM

The multi-axis servo drive, CSDM, is designed to provide an integrated motion solution for applications with output power requirements between 100W to 1.5kW. This compact sized multi-axis servo drive provides the best simplicity,

allowing you to save time and money from initial wiring, programming for operation, and diagnostics.

The modular type CSDM provides the real time motion control and maximum 8 axes can be installed on a power rail. The power rail provides common dc bus configuration for both main dc power used for the motor and auxiliary dc power used for control power. Therefore, it can help share the regenerative energy due to the common dc bus configuration. Also, the power rail can be used for control signals instead of wires. The power rail allows faster and easier layout and installation and provides a reliable system for grounding and bonding.

Another advantage of CSDM is that the dc bus voltage for the control power is fed by the main dc bus voltage after the main power is applied. This method provides the benefit of additional regenerative energy dissipation. This dissipation reduces the need for shunt resistor power rating.

Its simple modular design lowers wiring costs by greatly reducing the total number of connections. The compact size translates into greater flexibility for machine design and more production in the same floor space.

Teamed with the MMC-II, the CSDM is ideal for small and mid-sized applications where productivity, quality, and time to market should be improved while reducing total cost of ownership.

In addition, CSDM shares dc bus voltage with other systems installed on a different power rail. In this case, the master IAM to which AC source power is supplied sends dc voltage to the slave IAM. One main advantage of this kind of common dc bus is to minimize the cumulative energy of the system due to an equal balance of drives which are under regenerating and motoring. This method is useful that the system is difficult to install the 8 axes power rail considering the panel size. Figure 2 shows the example of CSDM axis configuration.

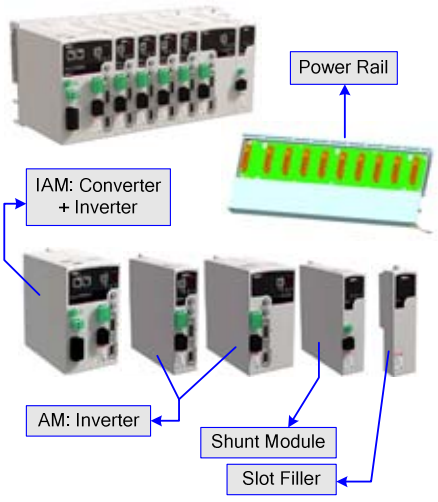

Fig. 2. CSDM axis configuration example

4. SYSTEM CONNECTION

Figure 3 shows the wiring comparison between conventional application and MMC-II/CSDM common DC bus application. The conventional application uses an analog MMC and component servo drive, CSD3+.

The MMC-II/CSDM application shows that the wires for communication and power are fairly reduced compared to conventional configuration. If the number of drive axes is increased more and more, the effect of wiring reduction could be remarkable.

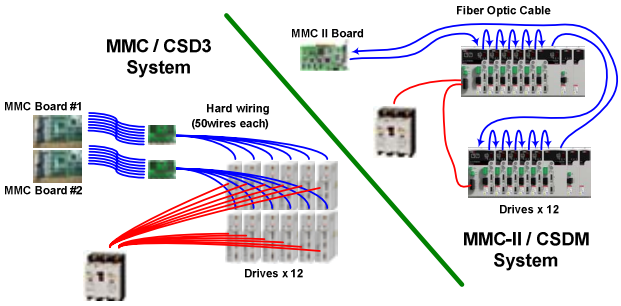

Fig. 3. Wiring comparison between conventional application and MMC-II/CSDM application

5. APPLICATION EXAMPLE

The MMC-II/CSDM system was used for the OLB machine for FPD manufacturing. This system is used for TCP (Tape Carried Package) bonding on a LCD panel using vision and high accuracy positioning system. The benefits of SERCOS motion controller MMC-II and network servo drive CSDM are shown in Table 2.

Table 2. Merits on MMC-II/CSDM application

Item	MMC & CSD3+	MMC-II & CSDM	Decrease Rate
Controller Qty	22EA	10EA	54.5%
Drive Qty	163EA	163EA	0%
Control Cable	3076m	270m	91.2%
Input Power Cable	1254m	196m	84.6%
Install Space	2.37m^3	2.16m^3	8.8%
Setup time	4h	3h	25%

The MMC-II and CSDM basically supports a servo motor with 17bit serial encoder and it does not need additional motor setting. Also, it can support the existing incremental encoder, so diverse application is possible.

6. CONCLUSION

Until now, the low power servo drive market in Asia is almost single or low axis solution. And a few manufactures provide multi axis solution using PLC. Therefore, the system design using MMC-II and CSDM is the best solution for multi axis solution. It helps user minimize the wiring time and related cost with reduced number of wires. The MMC-II and CSDM motion control system provides diverse opportunity of motion control solutions to the end-user or OEM machine makers.

REFERENCES

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