

New Product Addition to “GS Series” and Chinese Input Function

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Abstract

The GS Series is a low-cost lineup for overseas markets that was launched in 2013 as part of Mitsubishi Electric’s display business, and its functions have been continuously extended. We have developed the following with the aim of further improving added value in the Chinese market.

- (1) Development of large-screen model GS2512-WXTBD
- (2) Equipping with a Chinese input (pinyin conversion) function

Our aim is to expand our share of the Chinese market through development of these models and functions.

1. Introduction

Mitsubishi Electric has been continuously enhancing the functions of the GS Series, a low-price lineup aimed at the Chinese market, since its launch in 2013. However, the market demands models that offer higher functionality and larger screens while maintaining low prices, and the architecture of the current GS21-N model makes it difficult to meet these market needs.

Thus we introduced the GS25 model with a 12.1-inch wide screen to the market in January 2023 to meet these market needs. Figure 1 shows the lineup of Mitsubishi Electric displays for the Chinese market.

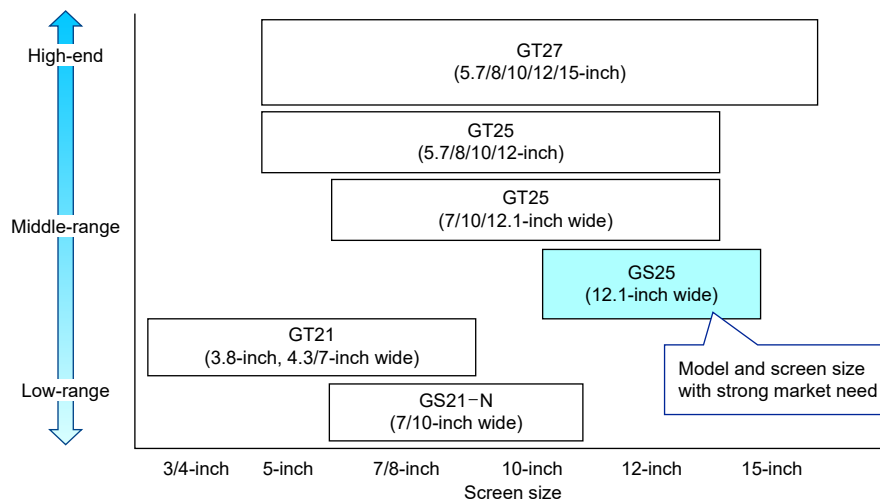


Fig. 1 Lineup of Mitsubishi Electric displays for the Chinese market

This paper describes product features, and the Chinese input (pinyin conversion) function using the Graphic Operation Terminal (GOT) for which there is a strong market need.

2. Purpose of Development

At Mitsubishi Electric, we are expanding our lineup and enhancing functionality by introducing products to the market that range from high-end models such as the GT27 to low-range models such as the GS series, in accordance with customer needs. Within this range, there has been increasing demand in recent years for low-priced models with large screen sizes such as 12-inch wide displays, but neither our company nor local Chinese companies currently have such models in their lineups.

By developing the GS25 model with a 12.1-inch wide screen, a low-priced yet large-screen model for which market needs are high, we aimed to expand the lineup of Mitsubishi Electric displays in the Chinese

market and enhance their added value. Also, by incorporating a Chinese input (pinyin conversion) function, which is in particularly high demand in the Chinese market, and the GOT Mobile function, which enables remote equipment maintenance, we aim to achieve synergistic effects with the addition of new models. This model achieves parts sharing and reduces development person-hours by basing its design on the architecture of the GT25 wide model, which has numerous built-in interfaces and functions.

In addition, we reduced manufacturing costs by manufacturing at our group company Mitsubishi Electric Automation Manufacturing (Changshu) Co., Ltd. (MEAMC) located in China, to develop a new model with high cost competitiveness.

3. Features

3.1 Product specifications

Hardware specifications for this model are shown in Table 1. The product is based on the GT25 wide model, thereby enabling connections and functions for diverse devices through numerous interface options.

Table 1 Hardware specifications

Item		GS25 model	GS21-N model (Existing model)
Screen size		12.1-inch wide	7/10-inch wide
Resolution		WXGA (1280×800 dots)	WVGA (800×480 dots)
Storage memory (ROM)		32MB	15MB
Operation memory (RAM)		128MB	-
Interfaces	RS-232	1ch	1ch
	RS-422/485	1ch	1ch
	Ethernet*1	2ch	1ch
	USB (host)	1ch (back side)	-
	USB (device)	1ch (front side)	1ch (back side)
	Sound output interface	1ch	-

*1 Ethernet is a registered trademark of the Fuji Film Business Innovation Corporation.

WXGA: Wide eXtended Graphics Array, WVGA: Wide Video Graphics Array

3.2 Equipped with 12.1-inch WXGA liquid crystal

This model is equipped with a 12.1-inch WXGA liquid crystal module, which is a large screen with high resolution. Compared to the existing GS21-N model (10-inch), it achieves approximately 1.4 times the screen size and about 2.7 times the resolution, enabling display of more information on a single screen (Fig. 2).

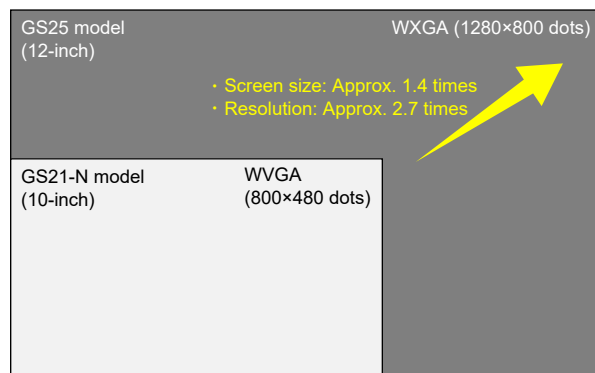


Fig. 2 Illustrative comparison of screen size and resolution

3.3 Chinese input (pinyin conversion) function

The Chinese input (pinyin conversion) function converts pinyin characters to the corresponding Chinese characters when pinyin is input, and this enables workers to input product names and other information in the GOT screen in Chinese (Fig. 3).



Fig. 3 Illustration of use of Chinese input function

In addition to displaying conversion candidates on the pinyin input screen, this function implements a “option selection window” function that displays a list of multiple conversion candidates in a separate window. The word to be converted can be easily selected by using the option selection window (Fig. 4).

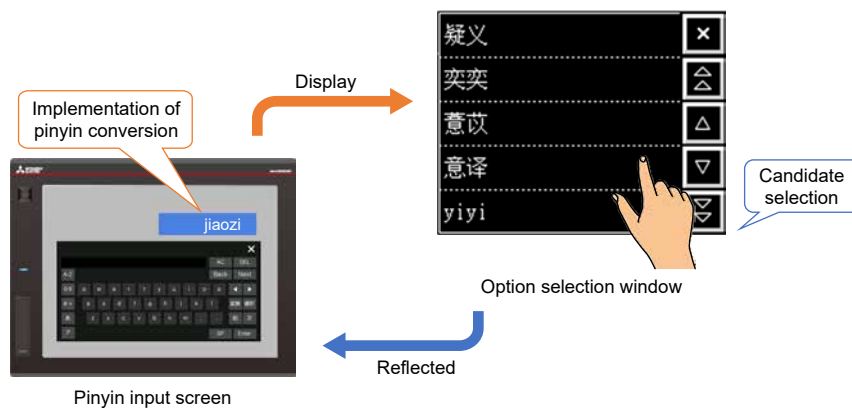


Fig. 4 Illustration of use of option selection window

3.3.1 Development background of the Chinese input (pinyin conversion) function

Previously, to input Chinese with GOT, an operation screen for entering Chinese characters was created on a computer and this was transferred to the GOT (writing of the operation screen to the GOT). Thus only preset Chinese characters could be input. Therefore, whenever users wanted to input new Chinese characters, they had to modify and transfer the operation screen, which was burdensome for users. Development of this Chinese input (pinyin conversion) function eliminates the need for operation screen modification and transfer, and greatly lessens the burden on the user (Fig. 5).

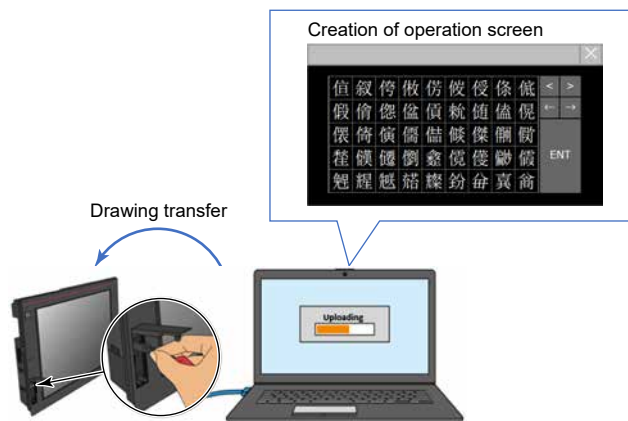
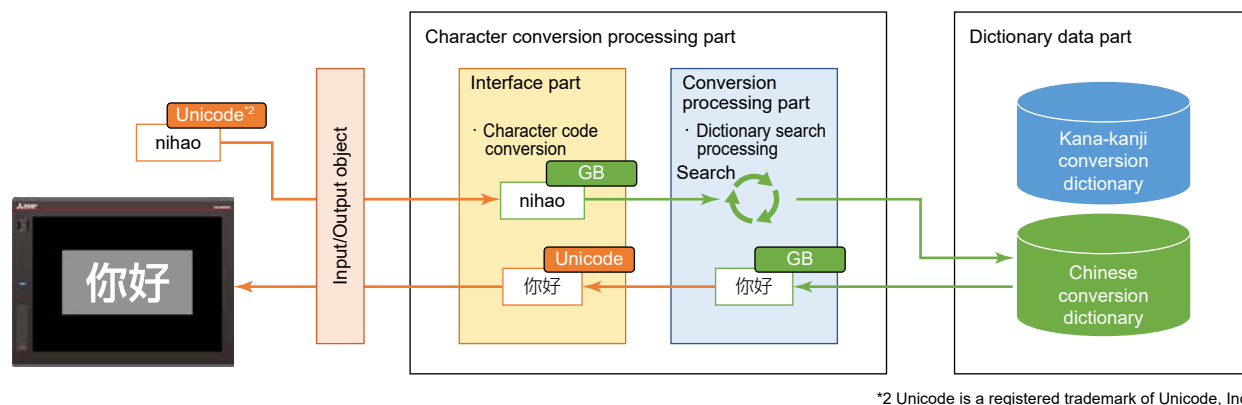


Fig. 5 Previous technique

3.3.2 Composition of software for Chinese input (pinyin conversion) function

The Chinese input (pinyin conversion) function has a character conversion processing part that converts the entered pinyin characters into Chinese characters, and a dictionary data part that contains conversion candidates for entered pinyin characters. In the interface of the character conversion processing part, character code conversion processing is performed for conversion to and reverse-conversion from character codes suitable for dictionary data. In the conversion processing part, processing is performed to search for conversion candidates from the entered pinyin characters using dictionary data (Fig. 6).



*2 Unicode is a registered trademark of Unicode, Inc.

Fig. 6 Illustration of software composition

One feature of the character conversion processing part is that it allows development of various character conversion functions by replacing dictionary data. For the GOT, the conventional “kana-kanji conversion function” (a function that converts kana input to kanji) was designed during development with the expectation of use with other languages, and this design allowed us to carry out the development this time with small workload.

3.3.3 Realization of the same function with different models

For the Chinese input (pinyin conversion) function, it was necessary to realize the same function in different models, such as middle-range and low-range models whose architectures are different. Therefore, by designing their interfaces to match the architectures of individual models, we were able to absorb the differences between models, and provide the same functionality (Fig. 7).

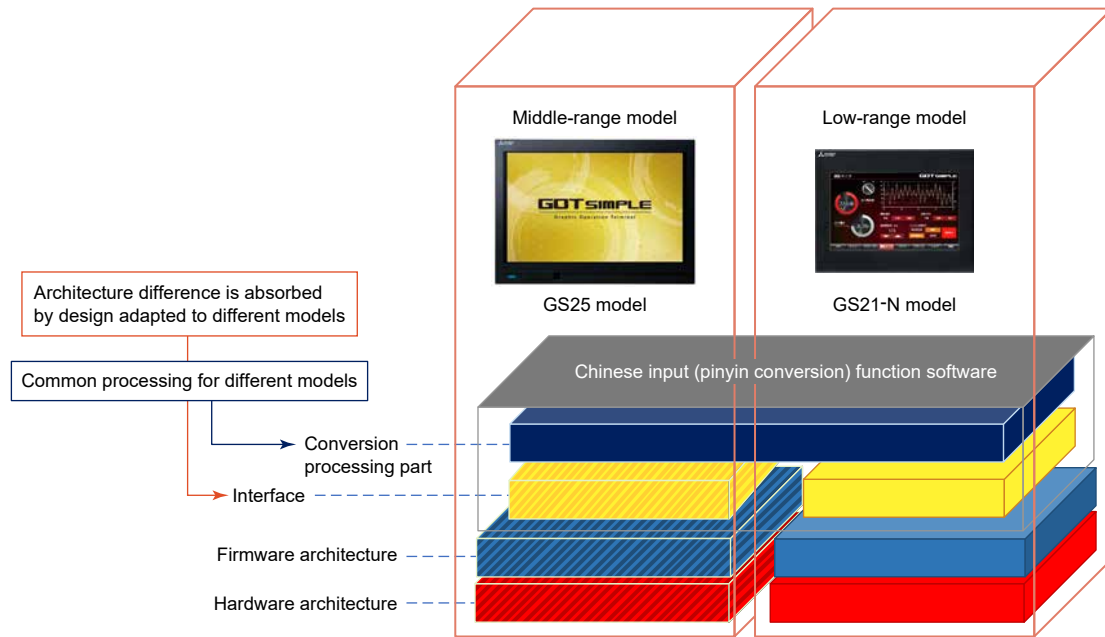


Fig. 7 Architecture differences between models

3.4 Two Ethernet ports as standard equipment

Equipped with two Ethernet ports as standard, it is possible to physically isolate the information network of facilities such as offices from the control network at production sites, enabling construction of secure networks (Fig. 8).

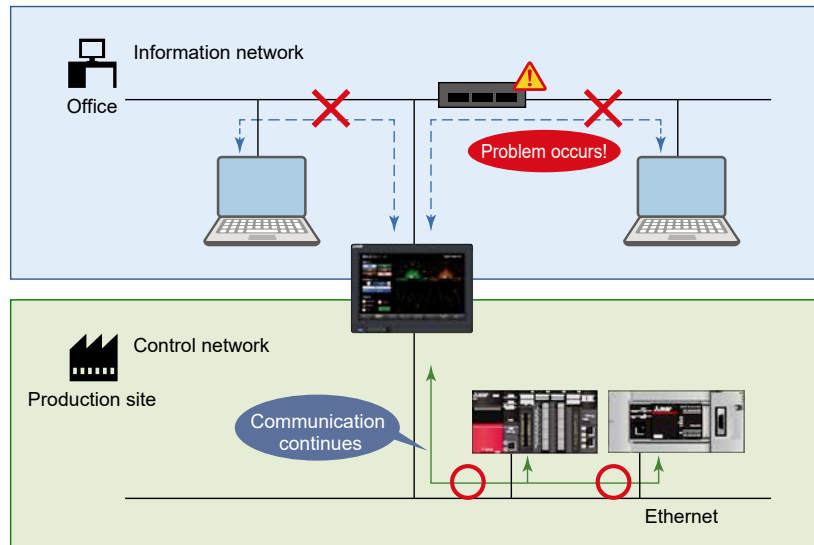


Fig. 8 Example of network construction

3.5 Equipped with sound output interface

Equipping the system with a sound output interface compatible with 3.5mm stereo mini plug realized the construction of an easy sound notification system by connecting general-purpose sound output devices. With the sound output function, notification of event content can be provided not only through display on the screen but also through sound, allowing necessary information to be more reliably communicated to workers (Fig. 9).

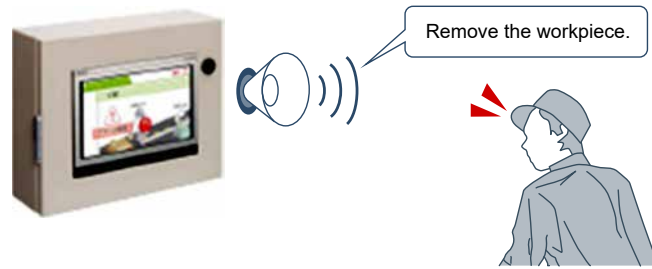


Fig. 9 Illustration of using sound output function

3.6 GOT Mobile function

The GOT Mobile function is a remote operation solution that enables monitoring and control of remote equipment by accessing the GOT using a web browser from various terminal devices such as smartphones, tablets, and computers. By using this function, it is possible to check the operational status of a production site while in an office, and for maintenance workers to control equipment using mobile devices, making remote maintenance easier (Fig. 10).

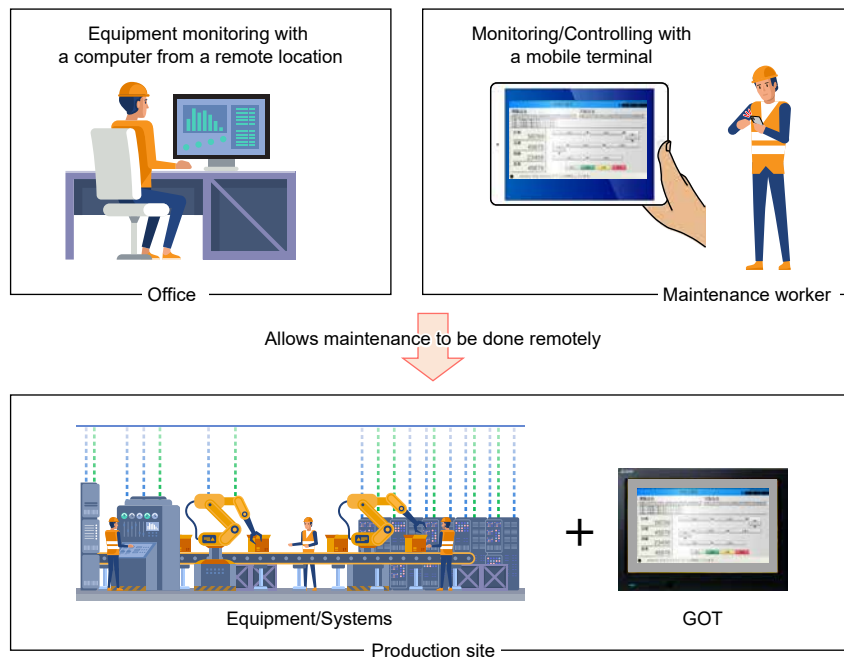


Fig. 10 Illustration of GOT Mobile function

With this function, five terminals can access a single GOT simultaneously, enabling multiple people to carry out operation from remote work locations such as worksites or offices. When multiple people are operating systems simultaneously, accident prevention measures are implemented by exclusive control of operation privileges to prevent simultaneous overwriting of the same parameters.

4. Conclusion

This paper has discussed the GS2512-WXTBD, which has a Chinese input (pinyin conversion) function in high demand in the Chinese market, while also featuring a large screen in a lower price.

Going forward, we will utilize the renewed architecture to continue meeting other market needs and strive to enhance the added value of Mitsubishi Electric displays.