TECHNICAL BULLETIN

[Issue No.] GOT-A-0013-A   **[Page]** 1/6
[Title] About Tone Reversal
[Date of Issue] Ver.A: June 2010 (First Edition: August 2006)
[Relevant Models] GOT1000 series
 GT1675-VNBA, GT1675-VNBD, GT1672-VNBA, GT1672-VNBD,
 GT1662-VNBA, GT1662-VNBD, GT1575-VNBA, GT1575-VNBD,
 GT1572-VNBA, GT1572-VNBD, GT1562-VNBA, GT1562-VNBD

Thank you for your continued support of Mitsubishi Graphic Operation Terminal (GOT).
While using the GOT1000 series GT1675-VN, GT1672-VN, GT1662-VN, GT1575-VN, GT1572-VN, or GT1562-VN, the display screen may be hard to see depending on the colors used or viewing angle.
Therefore, it is recommended to confirm the vision of the GOT screen from the actual operating position before use.
Depending on the characteristics of liquid crystal, the models other than above also may cause "tone reversal" described below.

Contents

Note) Abbreviations in this bulletin

GT1675-VN	Abbreviation for GT1675-VNBA and GT1675-VNBD
GT1672-VN	Abbreviation for GT1672-VNBA and GT1672-VNBD
GT1662-VN	Abbreviation for GT1662-VNBA and GT1662-VNBD
GT1575-VN	Abbreviation for GT1575-VNBA and GT1575-VNBD
GT1572-VN	Abbreviation for GT1572-VNBA and GT1572-VNBD
GT1562-VN	Abbreviation for GT1562-VNBA and GT1562-VNBD

TECHNICAL BULLETIN

[Title] About Tone Reversal
[Date of Issue] Ver.A: June 2010 (First Edition: August 2006)
[Relevant Models] GOT1000 series
                     GT1675-VNBA, GT1675-VNBD, GT1672-VNBA, GT1672-VNBD,
                     GT1662-VNBA, GT1662-VNBD, GT1575-VNBA, GT1575-VNBD,
                     GT1572-VNBA, GT1572-VNBD, GT1562-VNBA, GT1562-VNBD

1. Viewing angle characteristics of liquid crystal

Employing general TN-TFT LCD enables to offer the GT1675-VN, GT1672-VN, GT1662-VN, GT1575-VN, GT1572-VN, and GT1562-VN at competitive prices.

In some color combinations, the viewing angles shown in a catalog may differ from the actual viewing angle. (The specification of LCD viewing angle described in catalogs represents the angle where contrast ratio is equal to or more than 10:1. This also applies to Mitsubishi GOT.)

The actual viewing angle rests on the characteristics of liquid crystal referred as "tone reversal," and the display screen may be hard to see depending on viewing angle or colors used.

Therefore, the viewing angle shown in a catalog may differ from the actual viewing angle.

Viewing angle values (Contrast ratio: 10/1) for the GT1675-VN, GT1672-VN, GT1662-VN, GT1575-VN, GT1572-VN, and GT1562-VN in the catalog

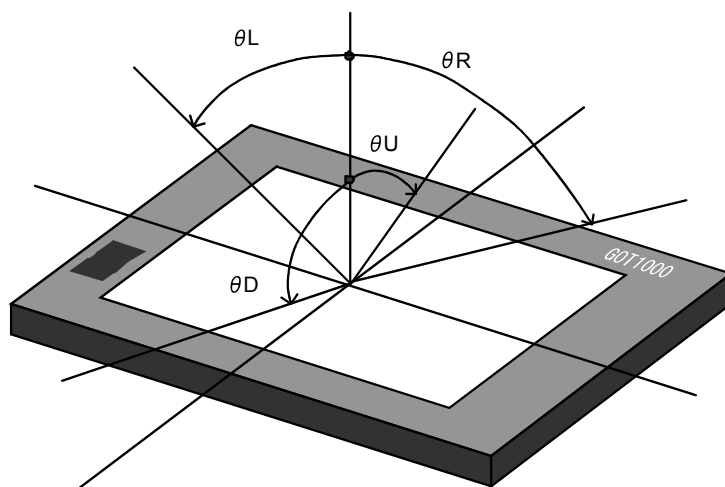| Model	Viewing angle
GT1675-VN, GT1575-VN	Right/left: 45 degrees, Up: 30 degrees, Down: 20 degrees
GT1672-VN, GT1572-VN	Right/left: 45 degrees, Up: 30 degrees, Down: 20 degrees
GT1662-VN, GT1562-VN	Right/left: 45 degrees, Up/Down: 20 degrees

Viewing angle definition

The viewing angles for the GOT are defined as follows (equivalent to the viewing angle specifications for LCD).
     Top viewing angle: θU (Condition: $\theta R = 0°$, $\theta L = 0°$, $CR = 10$)
     Bottom viewing angle: θD (Condition: $\theta R = 0°$, $\theta L = 0°$, $CR = 10$)

The CR represents contrast ratio which is calculated by the following formula.
     Contrast ratio (CR) = Intensity in white display/Intensity in black display

MITSUBISHI ELECTRIC CORPORATION

[Issue No.] GOT-A-0013-A   **[Page]** 3/6
[Title] About Tone Reversal
[Date of Issue] Ver.A: June 2010 (First Edition: August 2006)
[Relevant Models] GOT1000 series
　　　　　　　　　　GT1675-VNBA, GT1675-VNBD, GT1672-VNBA, GT1672-VNBD,
　　　　　　　　　　GT1662-VNBA, GT1662-VNBD, GT1575-VNBA, GT1575-VNBD,
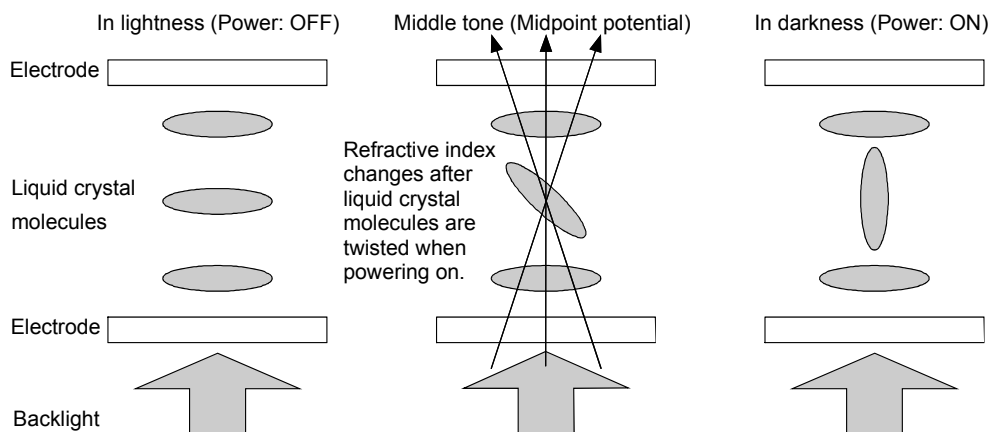　　　　　　　　　　GT1572-VNBA, GT1572-VNBD, GT1562-VNBA, GT1562-VNBD

The following explains a principle that "tone reversal" occurs.

A liquid crystal is composed of molecules whose short axis and long axis have different refractive indices.

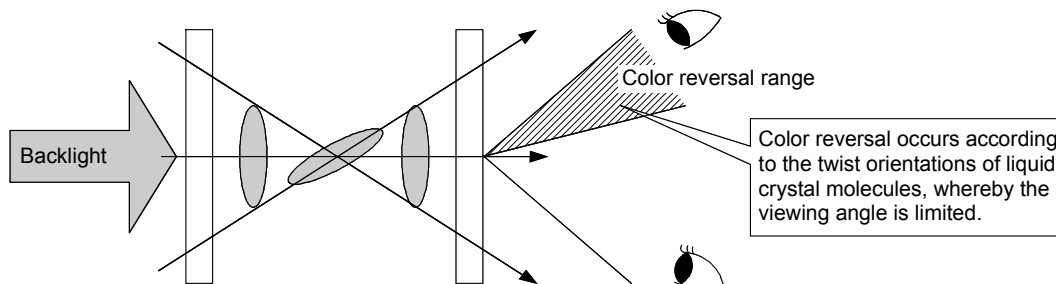Molecular architecture diagram of liquid crystal

Refractive index differs between
short axis and long axis.

Schematic diagram of TN LCD

In lightness (Power: OFF)　　Middle tone (Midpoint potential)　　In darkness (Power: ON)

Electrode

Liquid crystal
molecules

Refractive index
changes after
liquid crystal
molecules are
twisted when
powering on.

Electrode

Backlight

The TN LCD expresses gradation using the twist orientations of liquid crystal molecules as described above; however, color reversal occurs depending on a viewing angle.
Accordingly, the actual viewing angle (viewing angle where colors are reversed) does not correspond with the contrast viewing angle which is the specification for LCD.

Backlight

Color reversal range

Color reversal occurs according
to the twist orientations of liquid
crystal molecules, whereby the
viewing angle is limited.

[Issue No.] GOT-A-0013-A   **[Page]** 4/6
[Title] About Tone Reversal
[Date of Issue] Ver.A: June 2010 (First Edition: August 2006)
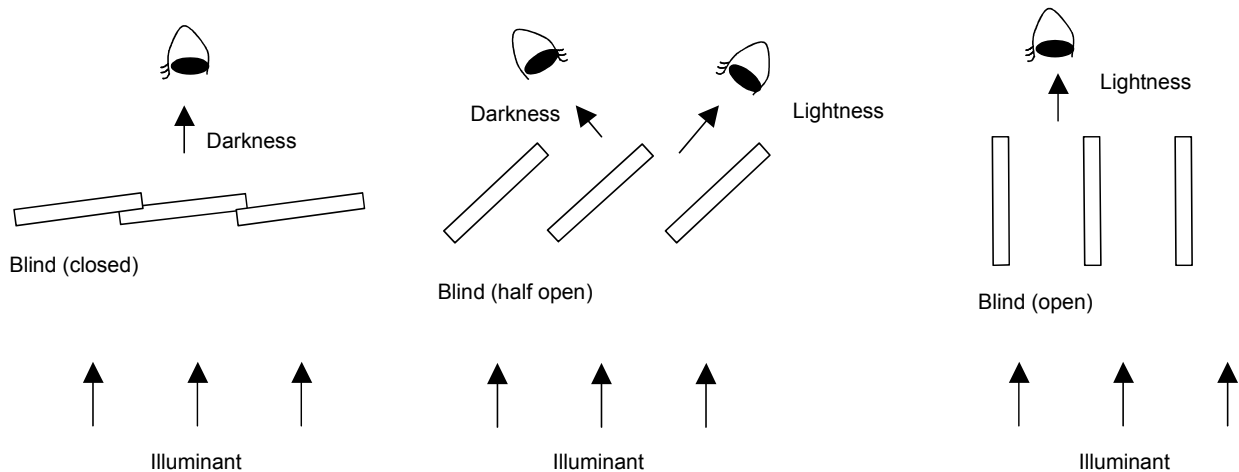**[Relevant Models]** GOT1000 series
　　　　　　　　　　　 GT1675-VNBA, GT1675-VNBD, GT1672-VNBA, GT1672-VNBD,
　　　　　　　　　　　 GT1662-VNBA, GT1662-VNBD, GT1575-VNBA, GT1575-VNBD,
　　　　　　　　　　　 GT1572-VNBA, GT1572-VNBD, GT1562-VNBA, GT1562-VNBD

Image for "tone reversal"

　　When a blind is opened half as the following figure shows, reversal occurs between "Lightness" and "Darkness"
　　depending on the viewing angle.
　　For LCD, the viewing ability changes by color reversal.

2. Colors subject to tone reversal
　　The following shows the colors subject to "tone reversal".
　　To create an easy-to-see screen, it is recommended not to use these colors.

　　(1) GT1672-VN (16 colors), GT1662-VN (16 colors), GT1572-VN (16 colors), GT1562-VN (16 colors)
　　　　Color selection window

　　In the object color selection window above, "Dark Blue", "Dark Green", "Dark Cyan", "Dark Red", "Dark Magenta",
　　"Dark Yellow", and "Dark White" are subject to "tone reversal". (Placing the mouse cursor on any color section
　　displays the color name.)
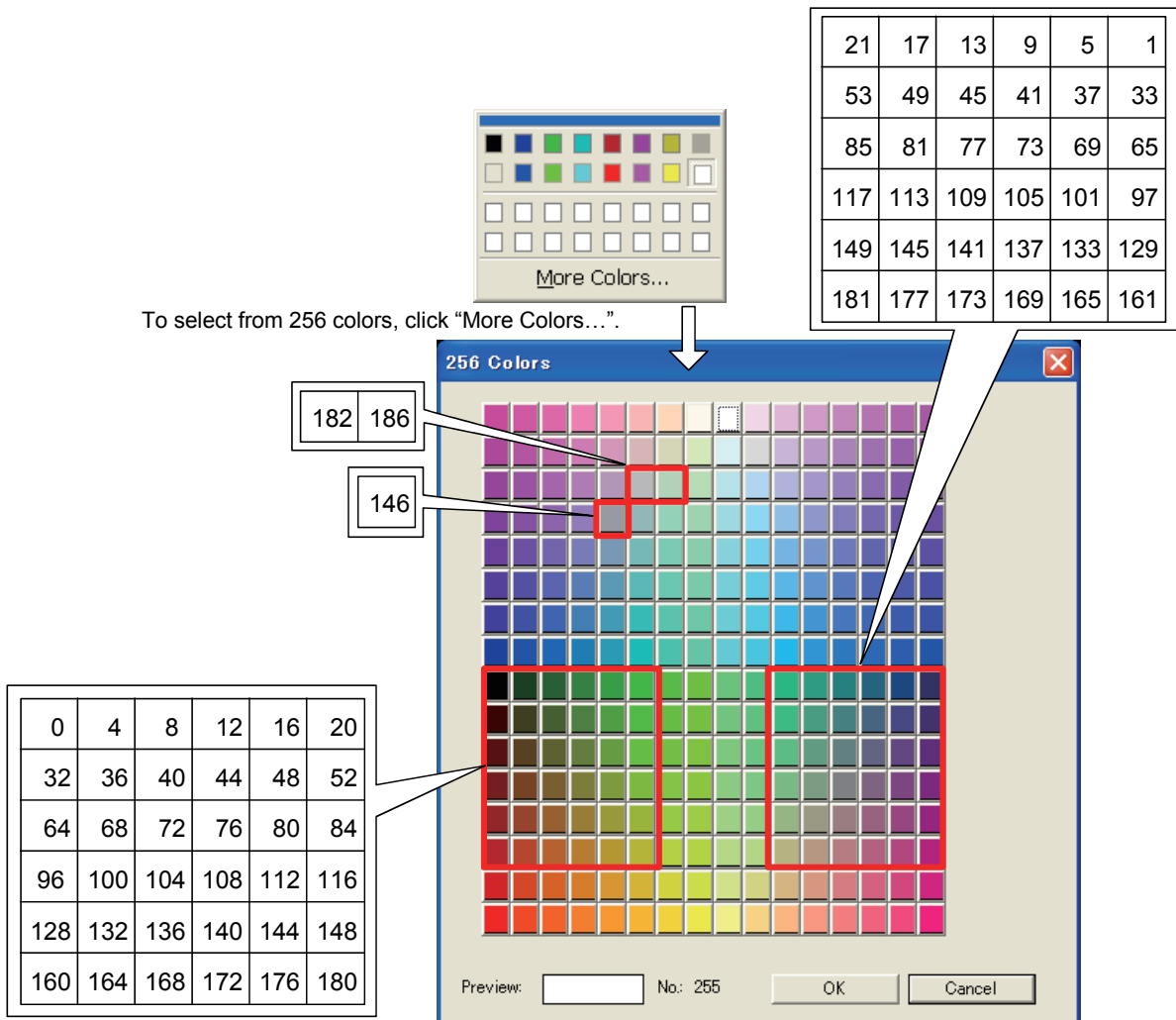
[Title] About Tone Reversal
[Date of Issue] Ver.A: June 2010 (First Edition: August 2006)
[Relevant Models] GOT1000 series
               GT1675-VNBA, GT1675-VNBD, GT1672-VNBA, GT1672-VNBD,
               GT1662-VNBA, GT1662-VNBD, GT1575-VNBA, GT1575-VNBD,
               GT1572-VNBA, GT1572-VNBD, GT1562-VNBA, GT1562-VNBD

(2) GT1675-VN (256 colors *1), GT1575-VN (256 colors)
   "When selecting "16 Colors" in the object color setting screen, the corresponding colors are the same as (1)."

21	17	13	9	5	1
53	49	45	41	37	33
85	81	77	73	69	65
117	113	109	105	101	97
149	145	141	137	133	129
181	177	173	169	165	161

To select from 256 colors, click "More Colors…".

182	186

146

0	4	8	12	16	20
32	36	40	44	48	52
64	68	72	76	80	84
96	100	104	108	112	116
128	132	136	140	144	148
160	164	168	172	176	180

The colors whose numbers are displayed with the object color selection window above are subject to "tone reversal." (Placing the mouse cursor on any color section and clicking it displays the color number on the side of the Preview field.)

*1 UP to 256 colors are available for the object color setting. Image data (bmp, jpeg) are displayed in 4096 colors.

MITSUBISHI ELECTRIC CORPORATION

TECHNICAL BULLETIN

[Title] About Tone Reversal
[Date of Issue] Ver.A: June 2010 (First Edition: August 2006)
[Relevant Models] GOT1000 series
　　　　　　　　GT1675-VNBA, GT1675-VNBD, GT1672-VNBA, GT1672-VNBD,
　　　　　　　　GT1662-VNBA, GT1662-VNBD, GT1575-VNBA, GT1575-VNBD,
　　　　　　　　GT1572-VNBA, GT1572-VNBD, GT1562-VNBA, GT1562-VNBD

Version	Print date	Revision
*	August 2006	・First edition
A	June 2010	・Models are added