MANUAL NO. 4330

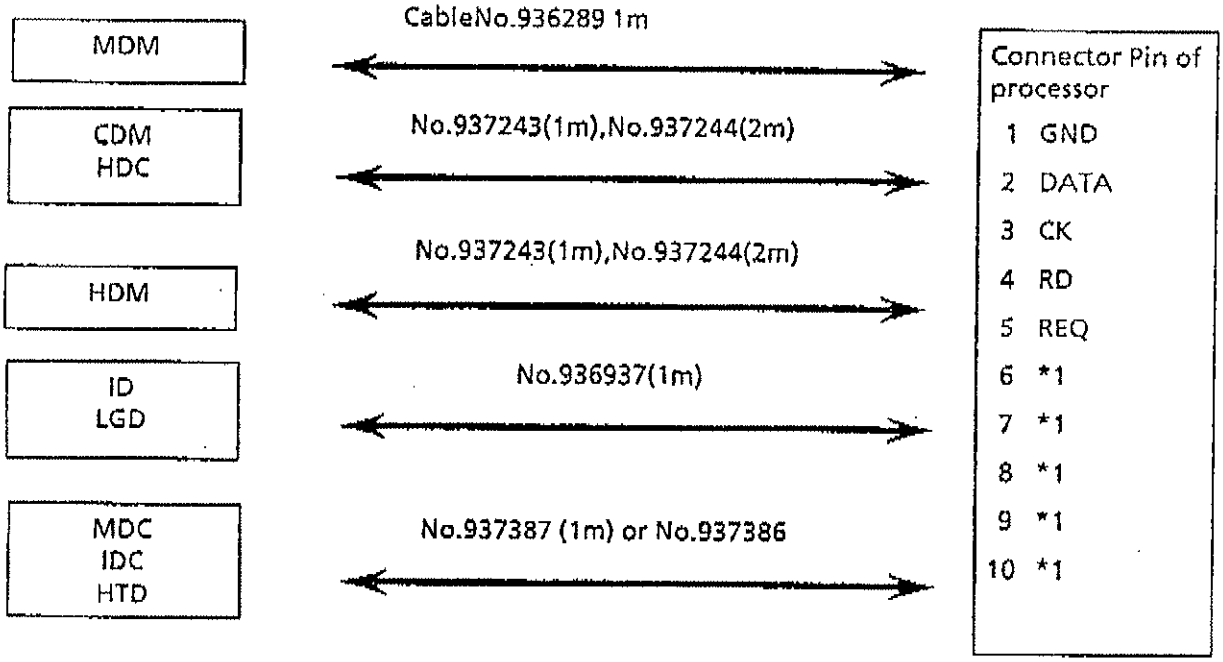
# DIGIMATIC CODE OUTPUT I/F SPECIFICATIONS

MITUTOYO

## 1. Application

This specification applies to interfaces between Mitutoyo Digimatic Measuring Tools and external devices for inputting digimatic code output data.

## 2. Connection with Digimatic Measuring Tools



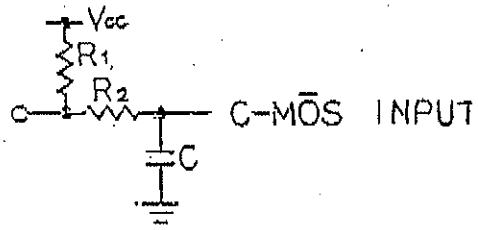

*1 Excluded from this specification (Connector :J3654-5002SC by 3M)

## 3. Signals

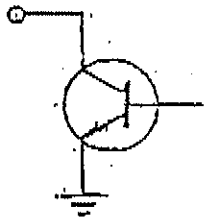
### 3.1 I/O of signals

| No. | Signal | Circuit | Description |
|---|---|---|---|
| 1 | GND | - | Signal Ground |
| 2 | DATA | TYPE A | Received Data |
| 3 | CK | TYPE A | Synchronous clock for data input |
| 4 | RD | TYPE A | Ready signal from gage |
| 5 | REQ | TYPE B | Request from external device for data output |

TYPE A




TYPE B



R1 = R2 = 20KΩ ± 10%
C = 100pF +80%/-20%

NPN Tr OPEN COLLECTOR
2SC2853 or equivalent

## 4. Electrical characteristics

### 4.1 Maximum ratings

| Item | Symbol | Rating | Unit |
|---|---|---|---|
| Line Voltage | Vcc | 4.75 - 5.25 | V |
| Input Voltage | $V_{IN}$ | 5.25 | V |
| Output Voltage | $V_{OUT}$ | 7 | V |

### 4.2 DC Characteristics

| Type | Item | Symbol | Condition | MIN | MAX | Unit |
|---|---|---|---|---|---|---|
| A | Low level input voltage | $V_{IL}$ | - | 0 | 0.8 | V |
| A | High level input voltage | $V_{IH}$ | - | 4.2 | 5.25 | V |
| A | Low level input currency | $I_{IL}$ | $V_{IL}$ = 0.8V | - | 250 | μA |
| B | Low level output voltage | $V_{OL}$ | $V_{OL}$ = 10mA | - | 0.1 | V |
| B | High level output leak currency | $I_{LOH}$ | $V_{OH}$ = 5.5V | - | -1 | μA |

4.3 AC characteristics

| Symbol | Timing | Min | Max | Unit |
|---|---|---|---|---|
| $t_1$ | Fig.4-1 | 0 | 2 | S |
| $t_2$ | Fig.4-1 | 15 | | µS |
| $t_3$ | Fig.4-1 | 100 | | µS |
| $t_4$ | Fig.4-1 | 100 | | µS |
| $t_5$ | Fig.4-1 | 0 | - | µS |
| $t_6$ | Fig.4-1 | - | 100 | µS |
| $t_7$ | Fig.4-2 *1 | - | 80 | mS |

*1 The external device must be set ready to receive the signal RD. In a case when it becomes impossible for the external device to receive the signal RD for the period of processing the input data, that period must be clearly specified for each external device concerned.

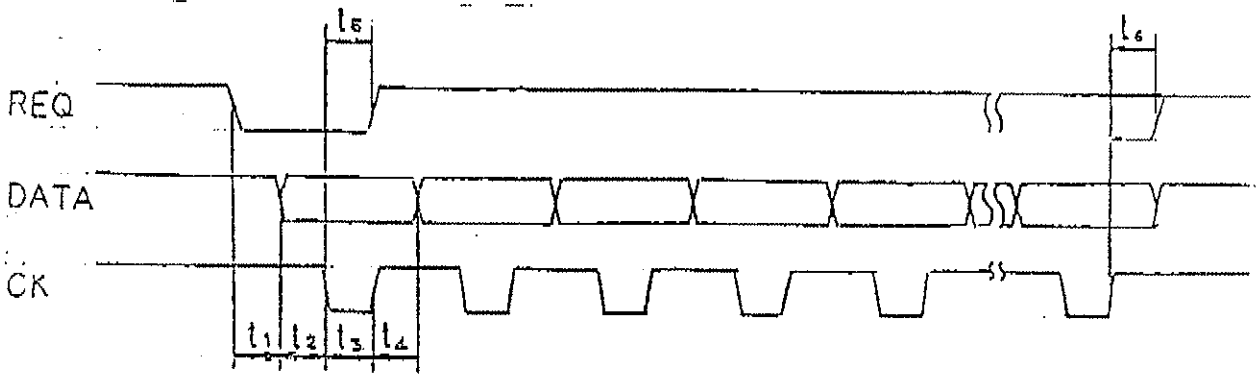



Fig.4.1

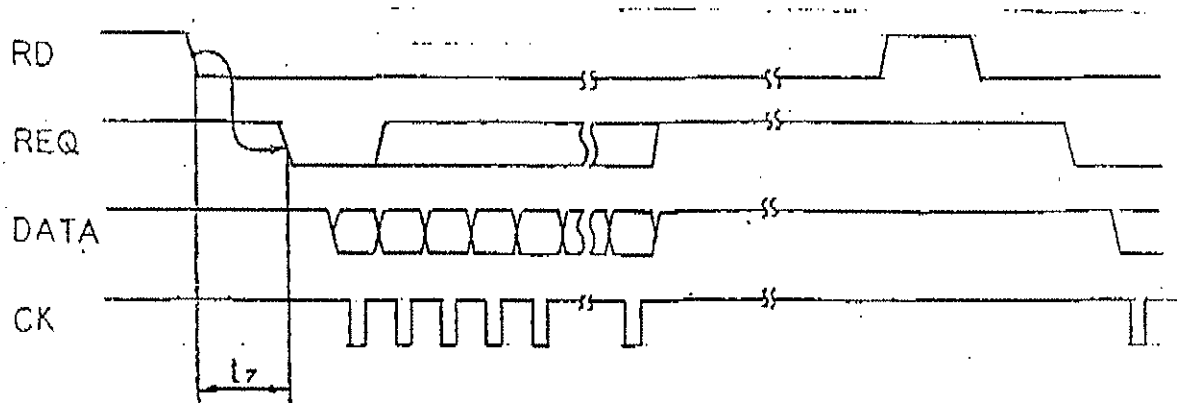


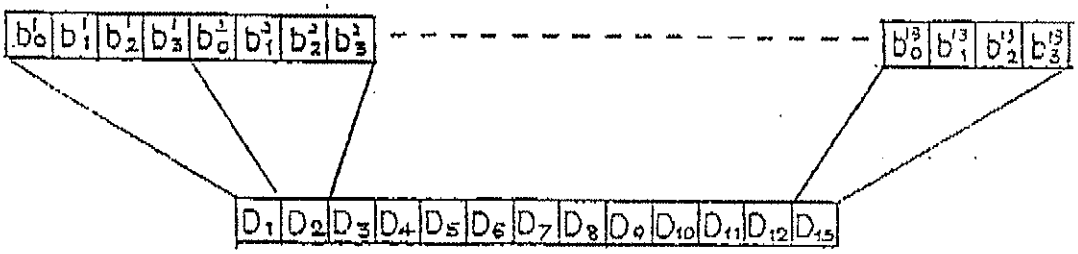

Fig.4.2

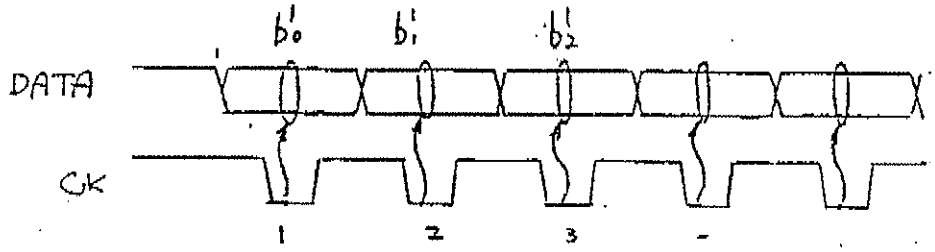
## 5. Data input procedures

By making REQ active (low level), data output is effected from a measuring tool in bit serial. Data is input in 13 digits $D_1$ through $D_{13}$ with four bits per digit. Each digit is received serially from LSB to MSB in a format described in the section 6.Bit reception is performed during the CK is active (low level). Data is in positive logic (0 = low level, 1 = high level).

Data input when the RD becomes active (low level) is also performed in the same procedures In a case when RD is created by a switch such as foot switch or the like, measures must be taken against the malfunction due to chattering.

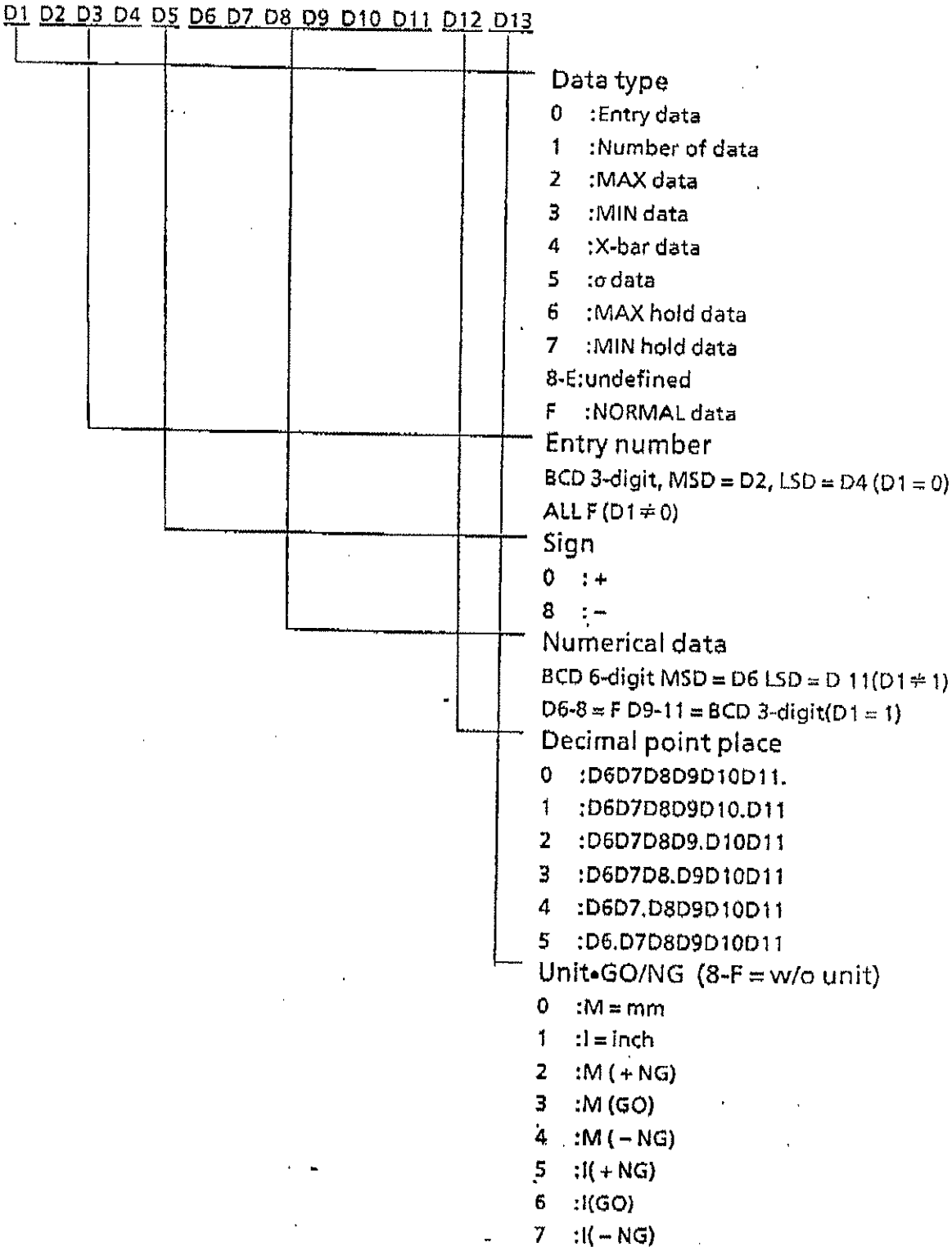
Order of data reception



# 6. Data Format

## 6.1 Data configuration



6.2 Data format

6.2.1 Entry data only for MDM

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | n | | | +/- | Xn | | | | | | . | M/I |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 2 | 0 | X1 = 123.45 M |
| 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 3 | 1 | X10 = 12.345 I |
| 0 | 1 | 0 | 0 | 8 | 0 | 1 | 2 | 3 | 4 | 5 | 4 | 2 | X100 = -1.2345 M(+NG) |

6.2.2 Number of data N only for MDM

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | N | | | | |

D2 - 8, D12, D13 = F

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | F | F | F | F | F | F | F | 0 | 0 | 1 | F | F | N = 1 |
| 1 | F | F | F | F | F | F | F | 0 | 1 | 0 | F | F | N = 10 |
| 1 | F | F | F | F | F | F | F | 1 | 0 | 0 | F | F | N = 100 |

6.2.3 MAX, MIN, X-bar, and σ data only for MDM

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | | | | +/- | MAX | | | | | | . | M/I |
| 3 | | | | +/- | MIN | | | | | | . | M/I |
| 4 | | | | +/- | $\overline{X}$ | | | | | | . | M/I |
| 5 | | | | +/- | σ | | | | | | . | M/I |

D2 - 4 = F

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | F | F | F | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 3 | 0 | MAX = 12.345 M |
| 3 | F | F | F | 8 | 0 | 1 | 2 | 3 | 4 | 5 | 3 | 0 | MIN = -12.345 M |
| 4 | F | F | F | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 3 | 0 | $\overline{X}$ = 12.345 M |
| 5 | F | F | F | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 3 | 0 | σ = 12.345 M |

6.2.4 MAX hold, MIN hold data only for ID, LGD

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | | | | +/- | MAX H. | | | | | | . | M/I |
| 7 | | | | +/- | MIN H. | | | | | | . | M/I |

D2 - 4 = F

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | F | F | F | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 4 | 1 | MAX H. = 1.2345 I |
| 7 | F | F | F | 8 | 0 | 1 | 2 | 3 | 4 | 5 | 4 | 1 | MIN H. = -1.2345 I |

6.2.5 NORMAL data

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | | | | +/- | X | | | | | | . | M/I |

D2 - 4 = F

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | F | F | F | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 2 | 0 | X = 123.45 M |
| F | F | F | F | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 3 | 1 | X = 12.345 I |
| F | F | F | F | 8 | 0 | 1 | 2 | 3 | 4 | 5 | 4 | 4 | X = -1.2345 M(-NG) |

Note: Data in the formats 6.2.1 through 6.2.4 are possible to output only when RD signal is output from Digimatic measuring tool. When RD is not active the data which is output by REQ signal from the external device is always 6.2.4 and 6.2.5 data. The NORMAL data can be output even against the RD signal.