MULTI-RECORDER
TMR-200
Small Multi-channel Data Acquisition System

- CONTROL UNIT
  TMR-211

- DISPLAY UNIT
  TMR-281

- MEASURING UNIT
  TMR-221 Strain full bridge unit
  TMR-222 Strain 1G2G4G unit
  TMR-231 Voltage/thermocouples unit
  TMR-241 Voltage output unit
  TMR-251 CAN/VOICE/GPS unit
  TMR-252 Telemeter I/F unit

OPTIONS

Tokyo Sokki Kenkyujo Co., Ltd.
MULTI-RECORDER
Small Multi-channel Data Acquisition System

PRODUCT CONCEPT
Conventional dynamic measuring instruments are specialized for strain, voltage and/or temperature measurements. If a system is set up in combination with strain and temperature or voltage and temperature, locations and wiring becomes troublesome, and settings for input and synchronous signal and output to an external device require a skilled work. As the TMR-200 can voluntarily combine various input units for strain, temperature and so on, the complex system can be simplified. For example, strain and temperature measurements in a material testing get possible by merely connecting the strain full bridge unit and voltage/thermocouple unit to the control unit. The number of measuring channels can be extended up to 80 by adding the necessary units.

EXPANDABILITY OF APPLICATION
Due to smallness and lightweight, the TMR-200 can be easily installed onto not only fixed structures such as machines and bridges but a moving body such as automobiles, aircrafts and shipping. In a vehicle measurement, there are so many and versatile testing themes as to comfortableness and safety with the development of computer-controlled products, and the related various sensors have being developed day by day. In compatibility with such versatile sensors, expanded units such as CAN/VOICE/GPS unit and telemeter unit are added to ordinary strain, voltage and temperature measuring units. Moreover, installation of an histogram analysis library (option) into the control unit TMR-211 makes real-time histogram analysis possible.

SUPERIORITY OF COMPACTNESS
The TMR-200 can combine the control unit and 10 each of measuring units, and installation area is as small as A4 size. By connecting the display unit enabling measuring and control without computer, setup space can be further reduced.

The multi-recorder TMR-200 series is a small multi-channel data acquisition system enabling combination of various measuring units according to experimental purposes. The testing objects are analog input such as stress, load, pressure, acceleration, etc. using strain gauges and strain gauge based transducers and digital input/output such as CAN, etc. on vehicle onboard measurement.
The multi-recorder TMR-200 series is a small multi-channel data acquisition system enabling combination of various sensor input units according to purposes. A high speed sampling of 100kHz is possible and sensor input units include not only analog input/output for strain, voltage, temperature, etc. but also digital input/output unit for CAN, etc. up to 80 channels. Real-time histogram analysis (option) as well as waveform recording is available. Connection with the display unit with color LCD makes data acquisition without computer from various settings to monitoring and measurement result display possible. Hooking up to a computer allows more sophisticated various histogram analysis system to be constructed.

**SYSTEM BLOCK DIAGRAM**

- **Combination of a plentiful and various sensor input/output units for strain, temperature, voltage, CAN, etc.**
- **The maximum measurement of 80 channels**
- **100kHz high speed sampling**
- **Vibration tolerance and small size suitable for vehicle onboard**
- **Battery operation**
- **Data recovery at power interruption and measurement restart at power recovery**
- **Various settings, monitoring and measurement result display with the display unit**
- **Compatible with large capacity CF card**
- **USB and LAN interfaces**
- **Histogram analysis in real time (Option)**

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**Notes:**

- Strain gauges
- Strain gauge transducers
- DC voltage
- Thermocouples
- CAN signal/GPS
- Voice/Telemeter
- Combined up to 10 units
- Display unit TMR-281
- Control unit TMR-211
- Histogram analysis library TMR-211-01
- Personal computer
- Compact flash memory card
- Measurement software TMR-7200 (bundled)
- Visual LOG
- Dynamic measurement software TMR-7830 (option)
- Recorders
- Oscilloscopes
- Digital indicators
- Automobile ECU, etc.
**SPECIFICATIONS**

**Number of channels**
- 80 (with 10 units according to choice of input units)

**Sampling**
- 0.01~0.09 ms (0.01 ms step) (High speed mode)
- 0.1~0.9 ms (0.1 ms step) (High speed mode)
- 1~20000 ms (1 ms step) (Low speed mode)

**Data memory**
- 1M words/channel (maximum number of records in high speed mode, divided by the number of channels)

**Trigger function**
- Data trigger: Data for any channel (Any input level, relative level from start)
- Command trigger: Command from interface
- Timer trigger: Real time, interval

**Simultaneous recording data**
- Operation history and time of a specific command

**Recording media**
- Compact flash memory card
- Max. 4G byte

**Interface**
- LAN
- USB

**Operating environment**
- -50~50 ℃, less than 85% RH (without condensation)

**Anti-vibration**
- 29.4m/s² (5~55 Hz) in 3 directions

**Power supply**
- DC 10V~30V 0.8A max. (with 12V dc supply, single)
- AC 90~250V 50/60Hz 25VA max. (option)

**Dimension**
- 200(W)×50(H)×100(D) mm (except projecting parts)

**Weight**
- 800 gr.

**Standard accessories**
- Operation manual .............................................................. 1 copy
- DC power supply cable CR-10 .......................................... 1 pc.
- Compact flash memory card (32M byte)............................ 1 pc.
- USB cable CR-6182 ........................................................... 1 pc
- Unit number seal ............................................................... 1 sheet
- Dynamic measurement software TMR-7200(CD-ROM) ... 1 pc.
- TMR-7200 operation manual ............................................ 1 copy

**DISPLAY UNIT TMR-281**

- **Display**
  - 5.7” color TFT LCD (320×240 dots) with touch panel
- **Display contents**
  - Numerical monitor, waveform monitor, start/stop of measurement, balancing control, settings for various measuring units, various analysis results, etc.

**Power supply**
- DC 10V~30V 0.8A max.

**Operating environment**
- 0~50 ℃, less than 85% RH (without condensation)

**Dimension**
- 200(W)×50(H)×110(D) mm (except projecting parts)

**Weight**
- 600 gr.

**Standard accessories**
- Operation manual ......................................................................... 1 copy
- Display unit connection cable 0.15m  CR-6441 ........................... 1 pc.

**CONTROL UNIT TMR-211**

- **Input Settings**
  - Reference contact compensation, sensor mode, coefficient/unit, display digits, etc.
- **Measurement Settings**
  - Settings of data trigger, sampling the number of data, program measurement, recording data, etc.
- **Output**
  - Voltage output, file management recording file display and output file name display
- **Others**
  - Setting of data and time, version information, TCP/IP setting list, toggled between Japanese and English

**Various Functions**

- Remaining capacity of CF card

**MENU**

- **Input**
  - Settings of reference contact compensation, sensor mode, coefficient/unit, display digits, etc.
- **Measurement**
  - Settings of data trigger, sampling the number of data, program measurement, recording data, etc.
- **Output**
  - Voltage output, file management recording file display and output file name display
- **Others**
  - Setting of data and time, version information, TCP/IP setting list, toggled between Japanese and English
### TMR-221 Strain Full Bridge Unit

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Number of channels</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Strain, Voltage (using CR-4010 option)</td>
</tr>
</tbody>
</table>

#### Strain measurement

- **Applicable gauge resistance**: 120~350Ω
- **Bridge excitation**: 0.5Vdc, 2Vdc
- **Measuring range**:
  - ±20000×10⁻⁶ strain (with 2Vdc bridge excitation)
  - ±80000×10⁻⁶ strain (with 0.5Vdc bridge excitation)
- **Measuring accuracy** ±0.2%FS (at 23±5°C)
- **Range switch**:
  - ±20000×10⁻⁶ strain (2 x 10⁻⁶ strain resolution)
  - ± 50000×10⁻⁶ strain (1 x 10⁻⁶ strain resolution)

#### Voltage measurement

- **Measuring range**: ±20V
- **Measuring accuracy**: ±0.3%FS (at 23±5°C)
- **Range switch**: ±20V range (2mV resolution)
  - ±10V range, ±10V range (1mV resolution)
- **Initial balancing method**: Electronic automatic
- **Balancing range**: ±10000 x 10⁻⁶ strain
- **Stability on zero**:
  - ±1 x 10⁻⁶ strain/C (at full sensitivity)
  - ±0.05%/C (at full sensitivity)
- **Frequency response**: DC~10kHz
- **Lowpass filter**
  - Cutoff frequency: 1Hz~1kHz (settable every 1kHz) Digital filter
  - Pass (10kHz) Analog filter
  - -3dB=±1dB
- **Cutoff characteristics**
  - Butterworth filter, Bessel filter
  - -12dB=±1dB/oct.
- **Power supply**: DC10V~30V, 0.2A max.
- **Operating environment**: 0~±50°C, less than 85%RH (without condensation)
- **Anti-vibration**: 29.4 m/s² (5~55Hz) in 3 directions
- **Dimension**: 200(W)×25(H)×100(D) mm (except projecting parts)
- **Weight**: 500 gr.

#### Standard accessories

- Operation manual ........................................... 1 copy
- Control cable CR-6460 ................................... 1 pc.
- Sensor input conversion cable CR-6186 ........ 1 pc.

### TMR-222 Strain 1G2G4G Unit

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Number of channels</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable gauge resistance</td>
<td>120~350Ω</td>
</tr>
<tr>
<td>Bridge excitation</td>
<td>0.5Vdc, 2Vdc</td>
</tr>
</tbody>
</table>
| Measuring range | ±20000×10⁻⁶ strain (with 2Vdc bridge excitation)
  - ±80000×10⁻⁶ strain (with 0.5Vdc bridge excitation)
| Measuring accuracy | ±0.2%FS (at 23±5°C) |

#### Voltage measurement

- **Measuring range**: ±20V
- **Measuring accuracy**: ±0.3%FS (at 23±5°C)
- **Range switch**: ±20V range (2mV resolution)
  - ±10V range, ±10V range (1mV resolution)
- **Initial balancing method**: Electronic automatic
- **Balancing range**: ±10000 x 10⁻⁶ strain
- **Stability on zero**:
  - ±1 x 10⁻⁶ strain/C (with full bridge at full sensitivity)
  - ±0.05%/C (with full bridge at full sensitivity)
- **Frequency response**: DC~10kHz
- **Lowpass filter**
  - Cutoff frequency: 1Hz~1kHz (settable every 1kHz) Digital filter
  - Pass (10kHz) Analog filter
  - -3dB=±1dB
- **Cutoff characteristics**
  - Butterworth filter, Bessel filter
  - -12dB=±1dB/oct.
- **Power supply**: DC10V~30V, 0.2A max.
- **Operating environment**: 0~±50°C, less than 85%RH (without condensation)
- **Anti-vibration**: 29.4 m/s² (5~55Hz) in 3 directions
- **Dimension**: 200(W)×25(H)×100(D) mm (except projecting parts)
- **Weight**: 500 gr.

#### Standard accessories

- Operation manual ........................................... 1 copy
- Control cable CR-6460 ................................... 1 pc.
- Small screwdriver ........................................... 1 pc.
- Full bridge terminal board ............................... 8 pcs.
- Bridge Box SB-120T or SB-350T ................... 8 pcs.
  (to be selected when ordering)
TMR-231 Voltage/Thermocouples Unit

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Number of channels</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Voltage, Thermocouples (T, K, J) isolated between channels</td>
</tr>
<tr>
<td><strong>[Voltage measurement]</strong></td>
<td></td>
</tr>
<tr>
<td>Input mode</td>
<td>Single-end (unbalanced)</td>
</tr>
<tr>
<td>Input impedance</td>
<td>Approx. 100kΩ</td>
</tr>
<tr>
<td>Measuring range</td>
<td>±20V</td>
</tr>
<tr>
<td>Measuring accuracy</td>
<td>±0.2%FS</td>
</tr>
<tr>
<td>Range switch</td>
<td>±20V range (2mV resolution)</td>
</tr>
<tr>
<td></td>
<td>±10V range (1mV resolution)</td>
</tr>
<tr>
<td></td>
<td>±5V range (0.5mV resolution)</td>
</tr>
<tr>
<td></td>
<td>±1V range (0.1mV resolution)</td>
</tr>
<tr>
<td>Stability on zero</td>
<td>±0.1mV/C (with ±1V range)</td>
</tr>
<tr>
<td>on sensitivity</td>
<td>±0.05%/C (with ±1V range)</td>
</tr>
<tr>
<td>Frequency response</td>
<td>DC~10kHz</td>
</tr>
</tbody>
</table>

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TMR-241 Voltage Output Unit

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Number of outputs</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output signals</td>
<td>Voltage outputs of measuring data with other units (Settable for any measuring points)</td>
</tr>
<tr>
<td>Output level</td>
<td>±V10V, ±5V, 0~±5V (at 5kΩ load)</td>
</tr>
<tr>
<td>Output accuracy</td>
<td>±0.5%FS</td>
</tr>
<tr>
<td>Calibration output</td>
<td>±10V, ±5V (with ±10V setting)</td>
</tr>
<tr>
<td>SN ratio</td>
<td>50dBp-p or more (at a maximum output of 10V)</td>
</tr>
<tr>
<td>Stability on zero</td>
<td>±0.5mV/C</td>
</tr>
<tr>
<td>on sensitivity</td>
<td>±0.05%/C</td>
</tr>
<tr>
<td>Power supply</td>
<td>DC 10V ~ 30V, 0.3A max.</td>
</tr>
<tr>
<td>Operating environment</td>
<td>0~+50°C, less than 85%RH (without condensation)</td>
</tr>
<tr>
<td>Anti-vibration</td>
<td>29.4m/s² (5~55Hz) in 3 directions</td>
</tr>
<tr>
<td>Dimension</td>
<td>200(W)×25(H)×100(D) mm (except projecting parts)</td>
</tr>
<tr>
<td>Weight</td>
<td>500 gr</td>
</tr>
</tbody>
</table>

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**TMR-200 MULTI-RECORDER**

Lowpass filter
- Cutoff frequency: 1Hz~1kHz (settable every 1kHz) Digital filter
- Pass (10kHz) Analog filter
- ~3dB±1dB
- Cutoff characteristics: Butterworth filter, Bessel filter
- ~12dB±1dB/oct.

**[Thermocouple measurement]**
- Measuring range:
  - T: -200~+400°C
  - K: -200~+1300°C
  - J: -200~+1200°C

- Measuring accuracy
  - Internal reference contact: ±(0.5% rdg.+1°C) (at 23±5°C)
  - ±(0.5% rdg.+2°C)
  - External reference contact: ±(0.2% rdg.+1°C) (at 23±5°C)
  - ±(0.2% rdg.+2°C)

- Range switch:
  - T: -200~+400°C (0.1°C resolution)
  - K: -200~+600°C (0.1°C resolution)
  - J: -200~+1300°C (0.2°C resolution)

- Frequency response:
  - DC~10kHz: -3dB±1dB
  - -12dB±1dB/oct.

**Digital filter**
- Cutoff frequency: 1Hz~1kHz (settable every 1kHz)

**Analog filter**
- Cutoff characteristics: Butterworth filter, Bessel filter
- -12dB±1dB/oct.

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Standard accessories
- Operation manual: 1 copy
- Control cable CR-6460: 1 pc.
- Small screwdriver: 1 pc.
TMR-251 CAN/VOICE/GPS Unit

SPECIFICATIONS

[CAN Interface]
- Compatible protocol: Conforms to CAN Specification V2.0B active ISO11898 (High Speed)
- Communication speed: 10k ~ 1Mbps
- Number of ports: 1 (maximum 2 units)
- Maximum number of messages: 16
- Functions: Data recording of designated ID, data output of designated channel, ID setting, communication speed setting
- Connector: D-SUB 9-pin connector

[GPS Recording]
- Compatible GPS receiver: TML designated GPS receiver
- Function: Acquisition of information on position and time, automatic time adjustment for TMR-211
- Connector: D-SUB 9-pin connector

[VOICE Recording]
- Number of inputs: 1
- Compatible microphone: Electret Condenser Microphone
- Applicable input connector: 3.5mm dia. 2-pole miniature plug
- Power supply: DC10V～30V, 0.4A max.
- Operating environment: 0～+50°C, less than 85%RH (without condensation)
- Anti-vibration: 2.94 m/s² (5～55Hz) in 3 directions
- Dimension: 200(W)×25(H)×100(D) mm (except projecting parts)
- Weight: 500 gr.

Standard accessories:
- Operation manual: 1 copy
- Control cable CR-6460: 1 pc.
- CAN cable: 1 pc.
- Microphone: 1 pc.

TMR-252 Telemeter I/F Unit

SPECIFICATIONS

Receiving data
- Number of connectable receivers: Max. 4
- Number of data: Max. 8 points
- Lowpass filter
  - Cutoff frequency: Max. 200Hz (in case of 1-point measurable receiver)
  - Cutoff characteristics: ~12dB/oct. (Bessel filter)
  - Operating environment: 0～+50°C, less than 85%RH (without condensation)
- Power supply: DC10V～30V, 0.2A max. (except receiver)
- Dimension: 200(W)×26(H)×100(D) mm (except projecting parts)
- Weight: 500 gr.

* The telemeter receiver DT-24R is needed for receiving electric wave
Histogram Analysis Library TM-211-01 (Software option for TMR-211)

| Analysis method | 1-dimensional frequency analysis  
| Amplitude | Level-crossing | Rainflow |
| Number of analyses | 16 (in 1ms sampling for any channel)  
| 80 (in 10ms sampling for Peak-valley method only) |
| Number of slices | Max. ±50 (100) optional setting |
| Full scale | 200 ~ 20000 x 10^-5 strain (effective for other methods than Time-frequency) |
| Count capacity | About 4.2 million counts/slice |
| Ineffective amplitude | 4~5000 x 10^-6 strain (effective for other method than Time-frequency) |
| Filing function | Recording in file of histogram data (Possible filing of histogram data at an interval and accumulated histogram data) |
| File making | Manual (creating at measurement stop)  
| Timer (creating according to programming measurement)  
| Recovery (Automatically renewing after power recovery) |
| Programming measurement: | Time of measurement start, interval time, number of measurements |
| Others | Waveform measurement trigger function due to frequency count |

Bridge Box SB-120T/SB-350T
This is a bridge box for the strain 1G/2G/4G unit TMR-222.

| Number of measuring points | 1 |
| Applicable gauge resistance | 120Ω (SB-120T)  
| 350Ω (SB-350T) |
| Connection | 3-wire quarter bridge, half bridge |
| Operating environment | 0~+50°C, less than 85% RH (without condensation) |
| Dimension | 20(W) x 14.5(H) x 25(D) mm (excluding projecting parts) |
| Weight | 10gr |

Thermocouple adapter TA-01KT
This is a thermocouple adapter for temperature measurement with DC exciting strainmeter.

| Number of measuring points | 1 |
| Applicable thermocouples | Type K, T |
| Response time | 20msec or less (0~90%) |
| Sensitivity | 10mV/°C (with 2V bridge excitation) |
| Operating environment | 0~+50°C, less than 85% RH (without condensation) |
| Dimension | 22(W)x41(H)x70(D)mm (excluding projecting parts) |
| Weight | 100gr |

Attenuation cable CR-4010
Used for voltage measurement with TMR-221

Display unit connection cable CR-6442
Used for extending between TMR-211 and TMR-281.  
1.5m long

Specifications are subject to change without prior notice.