Data Acquisition

DAQ Products
Masibus DAQ Range of Products

**DAQ Products**
- IO Cards for IIoT & PLC/DCS (MINT)
- Wireless Products
- Scanners & Data Loggers
- Protocol Converters
- IoT Gateway
- Solar String Monitoring Module
- Data Acquisition Software

**Examples:**
- AI-4 CH
- AI-8 CH
- AO-8 CH
- DI-16 CH
- DO-16 CH
- MSC-ZB-RS
- 85XX+
- 8208
- 8204
- 8040
- MSC-ME-MS
- HT16u
- MSC-PS-MS
- MSC-ME-ZB
- HT16Ew
- SMART Software
- MSG-21
- SBM-S-1225
What is IoT?

The Internet of Things (IoT) describes the network of physical Objects/Things that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.

IoT Application can be classified broadly in Commercial & Industrial Domain as below:

### Consumer IoT

Consumer IoT solutions are focused on individual users or families through the use of wearables (e.g. Smart Watch), smart home applications, and personal monitoring/assisting devices (e.g. Mobile Phone). A suitable example are voice smart assistants such as Amazon's Echo, Google's Home, and Apple's HomePod, in other words, products that make our lives easier by performing tasks or services for us. It's the network of connected devices and systems that can communicate and exchange data with each other.

### Industrial IoT (IIoT)

Unlike Consumer IoT, Industrial IoT targets existing automated industrial systems looking for dramatic improvements in productivity and efficiency. The most common IoT requirements comes from large scale factories or manufacturing plants, IoT also comes into picture for monitoring utilities and expensive assets. The IoT and IIoT ecosystem is growing and will keep growing more than exponentially in future. For this reason, we have to make sure that we choose the right products with suitable connectivity and functionality for our solutions in order to bring the sensor data to the supervisory level for suitable monitoring and decision making, the product should be having scalability feature to integrate more device in future with proper industrial handshaking & protocol.

### Automation Pyramid

![Automation Pyramid Diagram](image-url)
I/O Cards from Masibus (MINT)

MINT IO’s comes with below different options
1 RS-485 Port
1 RS-485 + Ethernet Port
2 RS-485 Port
Protocol support - Modbus RTU
Modbus TCP I/P

Can be connected with any make of PLC-CPU as I/O Card
Can be connected as Data Concentrator/Collector for IIoT Application

### MINT IOs

<table>
<thead>
<tr>
<th>Model</th>
<th>4-AI</th>
<th>8-AI</th>
<th>8-AO</th>
<th>16-DI</th>
<th>16-DO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channels</td>
<td>4</td>
<td>8</td>
<td>8</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Type</td>
<td>Voltage/Current (Fix)</td>
<td>RTD/TC/Voltage/Current (Universal)</td>
<td>Voltage/Current</td>
<td>24V DC input</td>
<td>Open collector 24VDC sink/source 100mA per O/P</td>
</tr>
<tr>
<td>Isolation</td>
<td>Supply to field: 1500VAC RMS, Supply to RS-485: 1500VAC RMS, Field to logic: 1500VAC RMS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scan Time</td>
<td>50ms/Ch.</td>
<td>RTD-100ms/Ch. Other-50ms/Ch.</td>
<td>All 8 Ch. in &lt;500ms</td>
<td>500 µs</td>
<td>Configurable</td>
</tr>
<tr>
<td>Resolution/Accuracy</td>
<td>16 bit ADC 0-1 %</td>
<td>16 bit ADC 0.1%</td>
<td>16 bit DAC 0.05%</td>
<td>1 KHz 32 Bit Counter</td>
<td>10ms Pulse O/P</td>
</tr>
</tbody>
</table>

### PLC with IOs on RS-485 - Modbus RTU

PLC

RS-485 - Modbus RTU

MINT AI-AO-DI-DO WITH RS-485

### Mint CP with I/O on Modbus TCP/IP to PLC & Mint IO’s to HMI on RS-485-Modbus

PLC

Modbus TCP/IP

HMI

RS-485 - Modbus RTU

MINT CP

MINT IO WITH RS-485
Application Examples

PLC/HMI as Multiple Clients Connect to MINT Ethernet IO on Modbus TCP/IP

PLC with IOs on RS-485 - Daisy Chain
**Application Examples**

**Communication Processor for MINT I/O**

- **Performance**
  - Maximum No. of Read Registers: 1024
  - Maximum No. of Write Registers: 1024
  - Maximum No. of Modbus Commands Supported: 100
  - No. of Slave Devices Supported per Serial Port: No. of Modbus devices supports on serial port - 15
  - No. of Clients Supported on TCP/IP: Up to 15

- **Communication**
  - RS-485 Serial Port: 2 Nos.
  - Protocol: Modbus-RTU slave
  - Ethernet Port: 1 Nos.
  - Protocol: Modbus TCP/IP (Modnet)

**Configuring MINT I/O as Redundant I/O System**

Diagram showing the configuration of MINT I/O as a redundant I/O system.
Application Examples

MINT-DI as 1 KHz High Speed Counter

RS-485 Modbus RTU
Totalizing Value / Counter Value To PLC/DCS

High Speed Counter 1KHz

MINT DI
Pulse O/P

Pulse O/P
Proximity O/P

Energy Meter with Pulse O/P
Flow Meter with Pulse O/P

Proximity Sensor

All 16 Channel can be configured as High Speed 32 Bits Counter of Frequency 1KHz

Configuring a larger I/O System with MINT I/O

PLC

Modbus TCP/IP

Modbus TCP/IP

Modbus TCP/IP

Modbus TCP/IP

MINT CP
MINT I/O WITH RS-485

SCADA

SCADA
Reproducing AI & DI Signal for a Long Distance Transmission
Concept of I/O Pair for DI & AI Signal for PLC & DCS System

I/O Pair for Analog Input

- 8 Channel Analog Input master-slave pair
- 16 Channel Digital Input master-slave pair
- Works with any PLC/DCS make
- Plug & play solution
- Reduces the cable cost for field signals
- Channel density can be increased or decreased if required

- Communication redundancy possible with 2 pair of dedicated RS-485 port
- No programming is required
- Master slave pair reproduces the signal from remote end to central PLC / DCS end up to 1200 meter a part
## Scanner & Data Logger

<table>
<thead>
<tr>
<th>Scanner &amp; Data Logger</th>
<th>8204</th>
<th>8208</th>
<th>85XX+</th>
<th>8040</th>
<th>8208-IP</th>
<th>8208-XP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
<td>4-Ch. Scanner</td>
<td>8-Ch. Scanner</td>
<td>8/16/24-Ch. Scanner &amp; Data Logger</td>
<td>128-Ch. Data Logger</td>
<td>8-Ch. Weather Proof Scanner IP-65 Enclosure</td>
<td>8-Ch. Ex-Proof Scanner for Hazardous Areas</td>
</tr>
<tr>
<td><strong>Input</strong></td>
<td>AI</td>
<td>-</td>
<td>8/16/24</td>
<td>16/24</td>
<td>16/128</td>
<td>4/8/4</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td>RL</td>
<td>4</td>
<td>8/16</td>
<td>8</td>
<td>16/4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>OC</td>
<td>-</td>
<td>24</td>
<td>32</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>AO</td>
<td>1</td>
<td>8</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Serial Port RS-485</strong></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Ethernet (ModbusTCP)</strong></td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Profibus DPV0</strong></td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>USB Pendrive Port</strong></td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Input Scan Time</strong></td>
<td>1 Sec.</td>
<td>1 Sec.</td>
<td>1 Sec.</td>
<td>3.2 Sec.</td>
<td>1 Sec.</td>
<td>1 Sec.</td>
</tr>
<tr>
<td><strong>Internal Data Log Memory</strong></td>
<td>-</td>
<td>-</td>
<td>32 MB</td>
<td>32 MB</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Isolation
- Power to Field 1500VAC
- Field to Communication 1500VAC
- Power to Communication 1500VAC
- Channel to Channel 125VAC/300VDC
- Power to Field 1500VAC
- Field to Communication 1500VAC
- Power to Communication 1500VAC
- Aluminium Alloy LM-6 Gas Groups
- IIA & IIB, IP65, Zone: 1, 2
- Optional IIC

### Enclosure
- ABS 1/8 DIN mount
- ABS 1/4 DIN mount
- Steel Sheet Powder Coated
- 19’ Sub-Rack
- Steel Sheet Powder Coated IP65
- prefab Cables IP65
- aluminium Alloy LM-6 Gas Groups
- IIA & IIB, IP65, Zone: 1, 2
- Optional IIC

### Connections
- Screw Terminals
- Screw Terminals
- Prefab Cables & Field Interface Module (Option)
- Prefab Cables & Field Interface Module (Option)
- Cable Gland
- Cable Gland
Application Examples

Motor Current, Temperature Monitoring & Control

- I/P 1
- I/P 2
- I/P 3
- I/P 4
- Relay O/P
- Motor On/Off
- 8204
- RTD
- RS-485 Modbus RTU

Berrel Zones Temperature Monitoring & Heater Control for Plastic Extrusion Machines

- Relays
- Heater ON/OFF Control
- Hopper
- Zone-1
- Zone-2
- Zone-3
- Zone-4
- Motor
- Die
Application Examples

8208-IP as Transformer Protection Relay

Winding Temperature Sensors

Core Temp. T7

T1
T2
T3
T4
T5
T6

8208-IP

RL1 → Alarm
RL2 → Trip
RL3 → Fan Control

Analog O/P to Indicator/PLC/DCS

RS-485 Modbus RTU

PLC

Motor Temperature Measurement & Protection

RS-485 to Remote PLC/DCS

IP65 Weather-proof Enclosure

8208-IP

8208-IP

8208-IP

HT Motor

HT Motor

HT Motor

HT Motor

HT Motor

HT Motor
Application Examples

Motor Temperature Measurement and Protection

CONTROL ROOM

RS-232
Printer
Ethernet
Ethernet
Existing LAN
PLC Controller

RS-485 Communication

85XX+ Scanner

RTD
Humidity I/P
Pressure I/P
Temperature I/P

4-20 mA

85XX+ as 24 Channel Analog I/O Module for any PLC/DCS

It can eliminate 3 RTD/3 Thermocouple & 16 Ch. DO PLC I/O Cards

24 Ch. RTD/Thermocouple

85XX+

Application Examples

Motor Temperature Measurement and Protection

CONTROL ROOM

RS-232
Printer
Ethernet
Ethernet
Existing LAN
PLC Controller

RS-485 Communication

85XX+ Scanner

RTD
Humidity I/P
Pressure I/P
Temperature I/P

4-20 mA

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24 Ch. RTD/Thermocouple

85XX+

Application Examples

Motor Temperature Measurement and Protection

CONTROL ROOM

RS-232
Printer
Ethernet
Ethernet
Existing LAN
PLC Controller

RS-485 Communication

85XX+ Scanner

RTD
Humidity I/P
Pressure I/P
Temperature I/P

4-20 mA

85XX+ as 24 Channel Analog I/O Module for any PLC/DCS

It can eliminate 3 RTD/3 Thermocouple & 16 Ch. DO PLC I/O Cards

24 Ch. RTD/Thermocouple

85XX+
Busbar Junction Temperature Monitoring for Preventive and Predictive Maintenance of LT Distribution Panels

Fiber Glass RTD PT100 Sensors with Cables

RS-485 Modbus RTU

8208

SMART Software

Configuring 85XX+ for 16-Digital Inputs 8-Relay Outputs & 24-Analog Inputs
Boiler Tube Temperature Monitoring System

*Benefits*

- 128 Channel Universal Input
- Channel to Channel Isolation
- 3 Second update rate
- 32 MB Internal Memory
- Periodic & Event based Data Logging
- RS-485 & Ethernet Communication Port available

8040 Data Logger Applications

- **128 Channel Universal Input**
- **Channel to Channel Isolation**
- **3 Second update rate**
- **32 MB Internal Memory**
- **Periodic & Event based Data Logging**
- **RS-485 & Ethernet Communication Port available**

**PLANT LAN**

- **Boiler Unit**
- **Modbus TCP/IP**
- **Modbus/OPC**
- **8040 Data Logger**
- **Data Logger Panel**
- **RS-485 to Ethernet Converter**
- **Modbus RTU/RS-485**
- **Alarm Dashboard (Optional)**
- **Gateway for Alarm SMS and Email Alert**

**Thermocouples Inputs**

**Avoid Unscheduled Outage**

**Availability & Tube Life**

**Reduce Secondary Damage**

**Identify Inefficient Heat Transfer**

**Increase Operating Profit**

**Easy Integration with Third Party System**

**Plug & Play Solution**

**High Price Performance Index**
Application Examples

8040 as 128 Channel Analog I/O Module for DCS/PLC

- It eliminates 16x8=128 channel AI card & associated power supply, rack, panels from DCS Panel
- Cost saving approximately 1 million INR

Current & Temperature Monitoring of Multiple Motors in a Plant

8040 Data Logger
Max. 128 Channel
Universal Input
32 MB Internal Memory

**Protocol Converter & Wireless Products**

- **mUSB232** (USB to RS-232 Converter)
- **MSC-RE-RS** (Modbus Serial to Modbus TCP/IP Protocol Converter)
- **MSC-RS-RS** (Isolated RS-485 to RS-485 Repeater)
- **HT16u** (Humidity-Temperature Smart Logger)
- **HT16Ew** (Wireless RH-T Transmitter)
- **MSC-RE-MS** (Modbus Serial to Modbus TCP/IP Data Concentrator/Gateway)
- **MSC-ZB-RS** (RS-485 Serial to ZigBee Wireless Converters)
- **MSC-ME-ZB** (Modbus-Zigbee to Modbus TCP/IP Data Concentrator/Gateway)
- **MSC-ME-MS** (Modbus Serial to Modbus TCP/IP Data Concentrator/Gateway)
- **SBM-S-1225** (08-12-16-20 String Box Monitor)
- **MSC-ME-MS** (Modbus Serial to Modbus TCP/IP Data Concentrator/Gateway)
- **MSG-21** (IloT Gateway)
- **MSC-SM-1225** (08-12-16-20 String Box Monitor)
- **mUSB485** (USB to RS-485 Converter)
- **mUSB232** (USB to RS-232 Converter)
Zigbee Offerings

What is Zigbee?

Zigbee is a wireless technology developed as an open global market connectivity standard to address the unique needs of low-cost, low-power wireless IoT data networks. The Zigbee connectivity standard operates on the IEEE 802.15.4 physical board radio specification and operates in unlicensed radio band 2.4 GHz.

Zigbee Protocol Features Include

- Support for multiple network topologies such as point-to-point, point-to-multipoint and mesh networks
- Low duty cycle - Provides long battery life
- Low latency time
- Direct Sequence Spread Spectrum (DSSS)
- Up to 65,000 nodes per network
- 128-bit AES encryption for secure data connections
- Collision avoidance, retries and acknowledgement

Zigbee signal range up to 100 meters indoor and up to 1 KM outdoor with clear line-of-sight (LoS) without obstacles. RF range extension also possible via adding Zigbee repeaters in the existing network (Mesh network).

MSC-ZB-RS
(MSC-ZB-485 Serial to ZigBee Wireless Converters)

MSC-ME-ZB
(Modbus-Zigbee to Modbus TCP/IP Data Concentrator/Gateway)

MSC-ME-ZB Features

- Supports up to 64 Modbus RTU Slave devices on RS-485 & ZigBee
- Number of Master Ports (Modbus RTU): 1 RS-485 (Wired) & 1 ZigBee (Wireless) - Only one active at a time
- ZigBee Topology: Point-Point/Point-Multipoint/Mesh
- Modbus TCP/IP (ModNet) - 10/100Mbps - Auto detecting
- No. of Client supports on Modbus TCP/IP (ModNet) - Up to 15
- Supports up to 192 commands or 2048 Read/1024 Write Registers on Modbus

MSC-ZB-RS Features

- Number of Ports: 1 RS-485 (Wired) & 1 ZigBee (Wireless)
- ZigBee Topology: Point-Point/Point-Multipoint/Mesh
- Router/Co-ordinator/Aggregator/Master/Slave configuration through MSC studio
- MSC-ZB-RS (Router/Slave) can connect to MSC-ME-ZB or MSC-ZB-RS (Co-ordinator/Master)
- Wireless range extension possible through router
Application Examples

Connecting 64 Modbus Devices Wirelessly Inside a Plant

100 Meter Indoor/ Upto 1 KM Outdoor (LOS)

Connecting Devices Wirelessly for EMS Solution

Zigbee Adaptor
MSC-ZB-RS

RS-485 Modbus
MSC-ME-MS

Existing LAN Connection

Monitoring Software

Web view
user-1

Web view
user-3

Zigbee Adaptor
MSC-ZB-RS

RS-485

2160-A

MFT20
Energy Meters

MFT
HT16u- Humidity Temperature Smart Logger

Features

- USB based HT16u with internal or external RH/T sensor with SS filter
- Temperature measurement -20 to 60 °C / -3.8 to 140 °F
- Humidity measurement 0 to 100 %
- Best in class accuracy @ 25°C +/-0.2°C temperature & +/- 2% RH
- Ultra low - battery power consumption with long life - CR2450 coin cell battery (1 Year @15min logging)
- Display battery status
- Logging start/stop - manual or pre-programmed (Auto) with pause facility
- SMART-HT free version - 3 devices in single report - Excel/PDF (Alarms & periodic data)
- SMART-HT license version - 10 Devices in single report/password protection in reports/21-CFR compliance with audit trials

Warehouse Layout - Room Temperature Mapping
HT16Ew - Wireless Humidity and Temperature Transmitter

Features

- Temperature & Humidity Measurements -20 to 60°C / 0-100% RH
- Deep sleep wakeup transmit on 2.4 Ghz ZigBee Wireless
- Zero data loss from device to SCADA with data backfilling
- 12 HT16Ew can connect to one wireless receiver
- HT16Ew with rechargeable battery - 1 year @ 15 min log
- RTC display and synchronization with SCADA
- IP65 Enclosure for protection against dust and water
- Wireless receiver can connect to SCADA on DNP3 Ethernet

Environmental Monitoring / Warehouse Monitoring

Environmental Monitoring / Clean Room Monitoring

21 CFR PART 11 COMPLIANT SOFTWARE
Protocol and Media Converters

Protocol Converters

Features
- It converts Modbus Serial to Modbus TCP/IP
- Supports max. upto 64 Modbus RTU slave devices on RS-485
- No. of RS-485 ports (Modbus RTU Master): 2 (Only one active at a time)
- Modbus TCP/IP (ModNet) - 10/100Mbps- auto-detecting
- No. of client supports on Modbus TCP/IP (ModNet) - Up to 15
- Supports upto 192 Modbus commands
- 2048 Read/1024 write registers on Modbus

MSC-ME-MS (Modbus Serial to Modbus TCP/IP Data Concentrator/Gateway)

Media Converters

Features
- Supports max. upto 247 Modbus RTU slave IDs.
- No. of RS-485 ports (Modbus RTU master): 1 No.
- Modbus TCP/IP (ModNet) - 10/100Mbps- Auto detecting
- No. of client supports on Modbus TCP/IP (ModNet) - Up to 4 No.
- Not required any Modbus query Mapping/Configuration

MSC-RE-RS (Modbus Serial to Modbus TCP/IP Protocol Converter)

MSC-ME-MS as Modbus Gateway OR MSC-RE-RS as Modbus Protocol Converter

MSC-ME-MS OR MSC-RE-RS

MSC-ME-MS as Modbus Gateway OR MSC-RE-RS as Modbus Protocol Converter

Features
- RS-485 half duplex communication
- Communication speed (Baud rate) 1200 - 115200 bps
- Auto baud rate detection
- Signal boost up to 1200m (Depends upon baud rate)
- Maximum 31 RS-485 nodes per repeater
- 120Ω termination resistor selection
- Isolation 1500VAC RMS

MSC-RS-RS (Isolated RS-485 to RS-485 Repeater)

mUSB232 (USB to RS-232 Converter)

mUSB485 (USB to RS-485 Converter)

MSC-ME-MS as Modbus Gateway OR MSC-RE-RS as Modbus Protocol Converter

MSC-ME-MS OR MSC-RE-RS

Features
- Convert the signals to RS-232
- Port: 9 PIN DB male connector
- Output - RS-232 full handshaking

• Convert the signals to RS-485 level
• Outputs: D + / D -
• Maximum 32 nodes
• 120Ω termination resistor selection
String Box Monitor (With Wired & Wireless)

Features

- 8/12/16/20 Channels String Inputs
- Built-in Shunt based DC Current Monitoring
- Measurement on the negative side string inputs
- Compatible with system voltage levels of up to 1500 VDC
- 02 RTD Sensor inputs for Temperature Monitoring
- 02 Digital inputs for DC disconnector and power SPD status
- -10°C to 70°C Operating temperature
- Input power supply: 18-36 VDC or 5 VDC
- 01 No. of RS-485 (2-wired) communication port
- On-board Wireless ZigBee communication module
- Modbus-RTU communication port
- Wireless ZigBee communication protocol
- Effortless communication with any SCADA system

String Box Monitor - Connection/Configuration

Solar PV Modules

String Combiner Box

Positive Side Fuses

Negative Side Fuses

Positive Busbar

Negative Busbar

Wireless ZigBee
Application Examples

**Layout – String Combiner Box to Control Room Communication**

- **1.** 44 nos. of String Combiner Boxes in 5MW Block
- **2.** Wireless Communication from SCB to Inverter Rooms
- **3.** String Data Available over Modbus TCP/IP @ Receiver
- **4.** Distance - 500+ Meters
- **5.** Zigbee Mesh Network

Solar Module Area

Inverter Room
MSG-21 - IIoT Gateway Solution for any Modbus Slave Devices

Features
• 4G Cellular modem (Micro SIM) with remote firmware update
  • Supported frequency bands: GSM: 900/1800MHz
  • LTE FDD: B1/B3/B5/B7/B8/B20/B28/B31/B72
  • LTE Cat1: 10 Mbps (DL) 5 Mbps (UL)
• Embedded web server for easy configuration
• JSON frame on MQTT server (SSL/TLS 1.2)
• On board 2 Digital Inputs & 2 Digital Outputs operate remotely via SMS & MQTT
• Selectable publishing interval for MQTT (1 minute to 1440 minutes)
• Support up to 16 Modbus slave devices or 128 Modbus read register
• Inbuilt RTC for time keeping & 4MB data logging during loss of cellular network

IO’s for IIoT

Remote Energy Monitoring Of Electrical Systems

Analog Digital Serial Parameters

PCC Panel / Switchgear Panel
SMART Data Acquisition Software

Features

- Online monitoring, data logging and reporting software
- Supports any Modbus devices
- Real time & historic trends display
- Report format supports - Excel/CSV/PDF/DOC/openoffice
- Database supports - MS access/ MySQL
- 21 CFR Part 11 Compliance/ Audit Trails
- 125+ Audit trials
- Licensed software - 64/128/256/512 tags supports