ENRAF TANK FARM GATEWAY CIU 888
The next generation CIU for reliable, accurate gauge and inventory data
Honeywell’s Enraf Tank Farm Gateway CIU 888 is the critical link between tank gauging equipment and control room systems. It provides the operator with reliable, accurate, real-time tank inventory data 24 hours a day, 7 days a week. Replacing the legacy 858 and 880 series, the CIU 888 serves as the data acquisition unit for tank measurement equipment, continuously scanning gauge data. It is used to calculate accurate tank inventory data according to international standardized calculation methods, such as the API, ASTM, GPA and many others.


All measured and calculated data is directly available for use by host applications such as the inventory management system, the DCS or management information system via multiple dedicated serial host links and network interfaces. Support of multiple protocols guarantees simple and reliable connectivity of installed field equipment to the control room. The modular design provides a flexible upgrade path for the future.

Enhanced Connectivity

The CIU 888 (pronounce as “triple eight”) series is the first fully Ethernet enabled CIU available in the market. While previous generations of tank interface units have been based mostly on serial interfaces, the CIU 888 offers connectivity via multiple Ethernet ports. Internal firewalls enable safe and secure connections with multiple systems simultaneously, control systems and Office LAN cannot interfere due to strict segregation. VPN connectivity allows remote connection, while the layered cyber security model (LCSM) helps to promote safety and security.

The CIU 888 robustness is based on strict industrial design rules. All boards are tropicalized (acc. ISA 71.04), and the CAE thermal design using heat-pipes instead of conventional fans results in a full ruggedized, all-solid-state, non-moving parts solution, built to last.

Unique autonomous redundancy features will ensure uninterrupted data availability to all users. Hot-Standby relay contacts provide real-time notification of CIU status and simplify handling by DCS-systems reducing downtime. Upcoming redundant Ethernet ports will complete the redundancy concept, simplifies implementation further reducing costs and ensure uninterrupted availability of data.

An easy-to-read colour display at the front provides diagnostic information, easy to interpreted, supporting faster service. The graphic diagnostic dashboard combined with a ring of light (a color-coded LED ring surrounding the key pad) provides an at-a-glance and unambiguous indicator of system health and availability.
Front view (with closed door)
- LCD color display for status and diagnostics
- Convenient lid automatically covers access to Service- and USB-port and keys for Configuration lock and W&M sealing
- Navigation keys and ring of light showing CIU status

Rear view (left to right)
- Two status relay contacts (Hot-Standby)
- VGA & Audio future use
- Two serial host ports: Compatible with Entis Pro
- Two USB ports: Auto-disabled; Future use
- 5 dedicated Ethernet ports, segregated by Firewall
- 6 flexible field and Host communication ports

Modbus TCP/IP communication between the CIU 888 and the host systems is established through FTEA, FTEB and Office LAN ports. CIU 888 exposes the same data (Modbus maps) over the Ethernet host ports as that exposed in the serial host ports.

### Technical Specifications—Functional (Software)

<table>
<thead>
<tr>
<th>General</th>
<th>Description</th>
<th>Application</th>
<th>Intended Use</th>
<th>Legal Metrology and Custody Transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Field scanning and communication interface for tank inventory applications with optional embedded tank inventory calculation functionality.</td>
<td>For all applications requiring accurate and reliable process and inventory data, such as refineries, tank farms and terminals. Data is suitable for custody transfer, safe product transfer and tank farm operation.</td>
<td>Control room equipment</td>
<td>Compliant to API-standards as stated by approval and certification by notified bodies as NMI.</td>
</tr>
<tr>
<td><strong>Intended Use</strong></td>
<td></td>
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</tbody>
</table>

### Functional Specification

<table>
<thead>
<tr>
<th>Tank Database</th>
<th>50 tanks (Entis Pro compatibility) and 80 tanks when CIU is connected to a Modbus host (not supported when Entis Pro is also scanning CIU 888)</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Redundancy</strong></td>
<td>Hot standby, real-time synchronization (redundancy controlled by Entis Pro or modbus host)</td>
<td></td>
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<tr>
<td><strong>Supported Gauge Models</strong></td>
<td>All GPU enabled tank gauges (such as 811, 813, 866, 854, 872, 873, 877, 894 and 990)</td>
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</tr>
<tr>
<td><strong>Gauge Commands</strong></td>
<td>• Lock test • Unlock • Block • Freeze • Calibrate (854, 894) • Density dip • Alarm test (SmartRadar) • Water dip</td>
<td></td>
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</tr>
<tr>
<td><strong>Tank Scanning</strong></td>
<td>6 field ports sequential and/or parallel, refresh rate 2-4 sec.¹</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Inventory Calculations</strong></td>
<td>Conform API MPMS Ch. 12.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tank Capacity Tables (strapping tables)</strong></td>
<td>Up to 5000 straps per tank, 400000 straps total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Support API/ASTM Product Calculations</strong></td>
<td>• ASTM D1250-80; conform Vol. X—Tables, 5, 6, 23, 24, 53, 54, 59, 60 and 59, 60 Alt-T, Product groups A, B, C &amp; D</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• API MPMS Ch. 11.1 (2007; adj. to ASTM D1250-04 and IP-200)—Tables, 5, 6, 23, 24, 53, 54, 59, 60 and 59, 60 Alternative Temperature, Product groups A, B, C, D</td>
<td></td>
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<tr>
<td></td>
<td>• API MPMS Ch. 11.2.4 (GPA TP-27)—Tables, 5, 6, 23, 24, 53, 54, 59, 60 and 59, 60 Alternative Temperature, Product group E</td>
<td></td>
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<td></td>
<td>• ASTM D4311-83—Table 1 and 2</td>
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<tr>
<td></td>
<td>• ASTM D4311-96—Table 1</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• ASTM D4311-04—Table 1 and 2</td>
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</tr>
<tr>
<td><strong>Available Gauge Data</strong></td>
<td>• Product level • Product temperature • Vapor pressure • Ambient temperature • Water level • Observed density (Servo, HTG, HIMS)</td>
<td></td>
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<tr>
<td><strong>Available (Calculated) Inventory Data</strong></td>
<td>• Volume (TOV, GOV, GSV, NSV) • Mass (Liquid, vapor, total) • Volume correction factor (VCF, CTL) • S&amp;W, Vapor (4 types), DCF, TCF, manual CTL</td>
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<tr>
<td><strong>Clock &amp; Time Synchronization</strong></td>
<td>Internal or external using Entis Pro or Modbus host systems such as DCS</td>
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</tbody>
</table>

¹ Refresh rate 2-4 sec. for sequential scanning, up to 4 sec. for parallel scanning.
Supported Engineering Units

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>Unit Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>m, mm, ft, in, in/16 and ft-in-16 (ft/16)</td>
</tr>
<tr>
<td>Temperature</td>
<td>°C, °F</td>
</tr>
<tr>
<td>Density</td>
<td>kg/m³, °API, lb/ft³, RD60/60, lb/USgal</td>
</tr>
<tr>
<td>Pressure</td>
<td>kgf/cm², kPa, psi(g), Pa</td>
</tr>
<tr>
<td>Volume</td>
<td>m³, USgal, bbl, L (L)</td>
</tr>
<tr>
<td>Mass/Weight</td>
<td>kg, lb, metric ton, long ton, US ton</td>
</tr>
<tr>
<td>Flow</td>
<td>m³/min, m³/h, l/min, bbl/min, bbl/h, USgal/min, USgal/h, UKgal/h</td>
</tr>
</tbody>
</table>

Available Tank Correction Methods
- CTSh³
- Floating Roof Weight

Host Connectivity
- Serial Ports: 2x modbus serial (+ 4 additional ports by using optional slots)
- Supported Host Protocols:
  - Serial modbus (Slave)
  - CIU 858 emulation
  - CIU 880 Prime/Plus emulation (serial modbus)
- Ethernet/LAN: 3x Modbus TCP/IP ethernet (FTEA, FTEB and Office LAN)

Field Connectivity
- Field Ports: 6x option slots (of which 4 ports can be used for serial host connectivity)
- Wireless Connectivity: ISA 100 via Honeywell WDM through TCP/IP to serial converters

Available Option Boards: Enraf BPM fieldbus, Serial modbus (master) and Serial GPU input

Compliance & Certifications
- European Directives: CE:
  - 2006/95/EC (Low voltage directive)
  - 2004/108/EC (EMC)
  - CAN/CSA-C22.2 No. 61010-1-12
  - UL Std. No. 61010-1 (3rd Edition)
- Self Monitoring & Diagnostics: Designed for compliance with NAMUR NE 107
- Legal Metrology (Weight & Measures):
  - NMI – Netherlands
  - PTB – Germany (pending)

Footnote:
1. Depending on number of used field ports, scan strategy, and baud rate.
2. Depending on gauge functionality.
3. Ambient temperature input required.

CIU 888 Option Board Specifications

Enraf BPM Field Bus Card (Pos 8 to 13 = B)
- Physical Layer: 2-wire Bi-phase mark modulated (MIL-STD-1553)
- Supported Protocol(s): Enraf BPM
- Typical No. Field Devices: 10-15, depending on cable spec and length
- Baud Rate: 1200/2400/4800 Baud
- Distance: 10 km or more depending on cable characteristics
- Cable Characteristics: 1 uF/200 Ohm max
- Type of Galvanic Isolation: Transformer coupled with ground shield
- Galvanic Isolation: 1500 V

Enraf Serial Communication Card (GPU Master (Input), Modbus Master (Input) and Modbus Slave (Host))
- Physical Layer: 2-4 wire RS-485 or RS-232C
- Protocol(s):
  - GPU Master (Field communication)
  - Modbus Master (Field communication)
  - Modbus Slave (Host communication)
- Baud Rate: 1200 up to 38400 Baud
- Type of Galvanic Isolation: Opto isolation
- Galvanic Isolation: 1500 V
- Number of Modbus Slave Devices (for modbus master field communications):
  - 32 modbus field devices (RS 485) multi-dropped
  - 1 modbus field device (RS232)
  - 50 devices can be configured (if connected through a converter/concentrator)
## Technical Specifications — Hardware

### Electrical

- **Power Supply**: 100-240 Vac, auto ranging (-15% to +10%), 45-65 Hz
- **Power Rating**: Max. 60 VA (35 VA nominal)
- **Nominal Start-Up Current**: 60 mA (Fuse: 2A Slow Blow); Start up current is (inrush): 60mA @230V
- **Over Voltage Category**: II
- **Cooling System**: 2 heat sinks with heat pipe design (no moving parts)
- **Battery**: Type 3V, 225mAh (for back-up system clock only—10 yrs. estimated life time)

### Operating System

- **O/S**: Linux Arch
- **Memory**: 4 GB Flash memory (upgradable)

### User Interface and I/O

- **Front Panel Display**: Backlight LCD color display (50 x 38 mm; 320 x 240 pixels) for status and diagnostics
- **User Input**: 6 switches (← → ↑ ↓ OK and Esc) with LED (ring of light) status indication
- **Key Lock Switches**: 2x (for configuration, resp. W&M sealing)
- **Relay Output**: 2x DPDT for CIU status (Hot Standby); contact rating: 30Vdc, 1A
- **Video Output**: SVGA
- **Audio Output**: Line out
- **Serial Ports**: 2x non-isolated RS-232C
- **Ethernet Ports**: 5x 10/100 Mb on back side (future use)
- **Service Ethernet Port**: 1x behind front panel—DHCP enabled, auto sensing, 10/100 Mb
- **USB Ports**: 1x behind front panel, 2x on back side—default disabled

### Environmental

- **Ambient Temperature**: 0 °C to + 60 °C (32 °F to 140 °F)
- **Storage Temperature**: -20 °C to 85 °C (-4 °F to 185 °F)
- **Enclosure Classification**: Against mechanical impact IP 30 (NEMA 1)
- **Humidity**: 0 to 90% non-condensing
- **EMC Class**: CLASS A

### Mechanical

- **Materials**:
  - Enclosure: Acryl painted steel
  - Heat sinks (left and right side): Black anodized aluminum
  - Front panel: ABS/PPE
- **Dimensions (WxHxD)**: 400 x 93 x 283 mm (15¾ x 3¾ x 11¼ in.)
- **Weight**: ~ 7.5 kg (16.5 lb) (excluding option cards)
- **Installation**: Wall mounting, 19" rack or table top (see Accessories)
- **Max. Load on Top (Table Top Use)**: 10 kg (22.0 lb)

### Available Accessories

- **Electrical**
  - **19" Installation Brackets (2x)**: Part. Nr. A0888904
  - **Wall Mounting Bracket**: Part. Nr. A0888903
  - **Set Ethernet Patch Cables (Cat5e) (6x)**: Part. Nr. A0888911
  - **Serial Null Modem Cable (9p)**: Part. Nr. S2570244 (3m/12ft) or S2570245 (12m/40 ft)
  - **Tag Plate (Bare)**: Part. Nr. A0888107
**Identification Code — Hardware Configuration**

**Pos 1** Application
- For Inventory Control of Bulk Storage Tanks
- Compliant with National W&M Requirements (specify country)

**Pos 2** Base Configuration Hardware
- CIU for Tank Inventory Management

**Pos 3** Memory
- 4 GB Flash

**Pos 4** Selection
- CIU 888 Hardware Configuration

**Pos 5, 6, 7** Product designation
- 8

**Pos 8** Field Card Slot 1
- Not Used
- Serial Modbus Input (Master)
- TRL/2 Fieldbus (Contact Honeywell representative)
- Enraf Fieldbus (BPM)
- Serial GPU (Input)

**Pos 9** Field Card Slot 2
- Not Used
- Serial Modbus Input (Master)
- TRL/2 Fieldbus (Contact Honeywell representative)
- Enraf Fieldbus (BPM)
- Serial GPU (Input)

**Pos 10** Field and Host Communication Slot 3
- Not Used
- Serial Modbus Input (Master)
- TRL/2 Fieldbus (Contact Honeywell representative)
- Host Serial Modbus (Slave)
- Enraf Fieldbus (BPM)
- Serial GPU (Input)

**Pos 11** Field and Host Communication Slot 4
- Not Used
- Serial Modbus Input (Master)
- TRL/2 Fieldbus (Contact Honeywell representative)
- Host Serial Modbus (Slave)
- Enraf Fieldbus (BPM)
- Serial GPU (Input)

**Pos 12** Field and Host Communication Slot 5
- Not Used
- Serial Modbus Input (Master)
- TRL/2 Fieldbus (Contact Honeywell representative)
- Host Serial Modbus (Slave)
- Host CIU Emulation
- Enraf Fieldbus (BPM)
- Serial GPU (Input)

**Pos 13** Field and Host Communication Slot 6
- Not Used
- Serial Modbus Input (Master)
- TRL/2 Fieldbus (Contact Honeywell representative)
- Host Serial Modbus (Slave)
- Enraf Fieldbus (BPM)
- Host CIU Emulation
- Serial GPU (Input)

**Pos 14** Extended Memory
- Not Installed

**Pos 15** Tag Plate
- Not Required
- Tag Plate Sticker Added

**Pos 16** Not Used
- Not Used
Identification Code — Software Functionality

Pos 1 Application
- For Inventory Control of Bulk Storage Tanks
- Compliant with National W&M Requirements (specify country)

Pos 2 Base Configuration Software
- Single CIU System
- Redundancy Enabled Per Unit

Pos 3 Functionality
- Based on CIU 888 Tank Gauging Interface

Pos 4 CIU Type
- Tank Gauging Software Functionality

Pos 5, 6, 7 Product designation
- Communication Interface Unit

Pos 8, 9 Interfacing and Calculations
- Scanning Functionality
- Scanning with Embedded Volume Calculation Module

Pos 10 Web Monitoring
- Configuration and Diagnostics

Pos 11 Host Communication OPC
- Not Enabled

Pos 12 Host Communication Modbus TCP/IP
- Not Enabled
- Standard Ethernet (Modbus slave)

Pos 13 Host Communication Fault Tolerant Ethernet
- Not Enabled

Pos 14 Remote Diagnostics
- Not Enabled

Pos 15 Field Communication Ethernet
- Not Enabled

Pos 16 One Wireless Connectivity
- Not Enabled

Pos 17, 18 Number of Tanks
- Max. tanks 5
- Max. tanks 10
- Max. tanks 20
- Max. tanks 30
- Max. tanks 40
- Max. tanks 50
- Max. tanks 60
- Max. tanks 70
- Max. tanks 80

Pos 19 Language
- English Only

Pos 19A Upgrade
- New CIU ordering
- Upgrade
  (Serial number of CIU and License required)

Typical Identification Code

Your Identification Code
Overall Dimensions

For More Information
To learn more about Honeywell’s Enraf Small Volume Provers, visit www.honeywollenraf.com or contact your Honeywell account manager.

Americas
Honeywell Enraf Americas, Inc.
2000 Northfield Ct.
Roswell, GA 30076
USA
Phone: +1 770 475 1900
Email: enraf-us@honeywell.com

Europe, Middle East and Africa
Honeywell Enraf
Delftechpark 39
2628 XJ Delft
The Netherlands
Phone: +31 (0)15 2701 100
Email: enraf-nl@honeywell.com

Asia Pacific
Honeywell Pte Ltd.
17 Changi Business Park Central 1
Singapore 486073
Phone: +65 6355 2828
Email: enraf-sg@honeywell.com

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