

# IVN5

## ONBOARD INTELLIGENT VEHICLE NETWORK



The Intelligent Vehicle Network (IVN5) is the vehicle logic unit that controls the complete Clever Devices ITS technology package on your vehicle. The brains of the vehicle, IVN5 is a rugged and powerful onboard computer specifically designed to manage your transportation applications, collecting and transmitting data, either in real-time or upon arrival in the depot.

## FEATURES & BENEFITS

### PURPOSE-BUILT INTELLIGENT PROCESSING POWER

IVN5 combines an Intel processor with a dedicated I/O coprocessor system to orchestrate the flow of information from its many interfaces in real time.

### NETWORKING CAPABILITIES

IVN5 supports Ethernet, Wi-Fi and Cellular connectivity. Ethernet is used to connect IVN to other systems on the vehicle such as digital signage, fare boxes, routers, onboard DVR and security systems, and passenger counters. Optional Wi-Fi capability enables the efficient transmittal of data from these systems when the vehicle returns to the depot. In scenarios where live data updates and real-time vehicle location is necessary, an IVN-connected cellular router sends data to a central processing point over a cellular network.

### CLEVERVISION CAPABILITIES

IVN5 supports the growing demand for rich infotainment on board transit vehicles and includes CleverVision content player capabilities. Flexible content triggering lets you provide meaningful, timely and targeted travel information to passengers throughout their journey.

### COMMUNICATION INTERFACES

#### Serial Ports

With 4 serial ports covering both RS232 and RS485 protocols, IVN5 can connect to your most important systems including your card readers, onboard signage, and fare boxes to enable you to collect and transmit data needed to manage your operations.

#### Heavy-Duty Vehicle Interfaces

Mainstays of modern industrial vehicles, J1708 and J1939 (CAN) communication buses offer a wealth of control and monitoring capabilities. IVN5 fully supports these standards for connecting to bus devices and monitoring critical drivetrain elements using Clever Devices' AVM.

#### Discrete Signals

IVN5 monitors signals for basic vehicle functions such as the stop request, wheelchair lift, and doors. This information is used to power various ITS applications and can be used to make important decisions about service ridership.

### POSITIONING

IVN5 uses a built in multi-constellation navigation receiver and input from an accelerometer, gyroscope, and the vehicle's odometer signal to maintain positioning even in challenging signal environments. Onboard software utilizes a Kalman filter to ensure accurate positioning of the vehicle at all times.

### AUDIO CAPABILITIES

IVN5 has built in audio amplifiers with 4 audio output channels driving the speakers on the vehicle for both interior and exterior announcements, including automated voice annunciation (AVA). To ensure appropriate volume control of all announcements, IVN5 is equipped with automatic volume control, auto-adjusting to the indoor and outdoor noise levels. Additionally, IVN5 provides operator handset support that enables the driver to easily communicate with dispatch, and a standard PA interface to allow for manual announcements.

# IVN5 Specification Chart

## ELECTRICAL

|                                                                                     |                                                                                                               |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Voltage</b>                                                                      | 24 V DC nominal; 9 – 36 V DC range                                                                            |
| <b>Current draw</b><br>(@ 24 V DC input)                                            | 1.2 A typical during normal operation, no audio outputs active                                                |
| Note: Current draw values exclude devices attached to IVN5's switched power outputs | 5.5 A maximum when driving audio to all channels<br>85 mA during low power mode                               |
| <b>Protection</b>                                                                   | Reverse polarity and overvoltage                                                                              |
| <b>Uninterruptible power supply</b>                                                 | Integrated; ~30 second holdup time                                                                            |
| <b>Switched power output</b>                                                        | 6 A synchronized with run switch<br>6 A synchronized with IVN5 wake/sleep<br>8 A combined maximum across both |

## COMPUTING

|                         |                                                                              |
|-------------------------|------------------------------------------------------------------------------|
| <b>CPU</b>              | Intel E3940 1.8 GHz quad core                                                |
| <b>RAM</b>              | 4 GB                                                                         |
| <b>Mass storage</b>     | 60 GB removeable industrial SSD standard, larger capacities available        |
| <b>Operating system</b> | Windows 10 IoT Enterprise                                                    |
| <b>Video output</b>     | 1x DVI to control head<br>1x HDMI to CleverVision display                    |
| <b>USB ports</b>        | 2x USB 3.0 behind front access door<br>1x USB 2.0, rear panel                |
| <b>User interface</b>   | Compatible with Clever Devices Transit Control Head (TCH) with DVI interface |

## NETWORKING

|                       |                                               |
|-----------------------|-----------------------------------------------|
| <b>Ethernet ports</b> | 2x Gigabit (1000/100/10Mbps)<br>4x 100/10Mbps |
| <b>WiFi</b>           | Optional 802.11 a/b/g/n/ac, internal          |

## VEHICLE INTERFACE

|                                |                                                                                                        |
|--------------------------------|--------------------------------------------------------------------------------------------------------|
| <b>SAE J1708</b>               | 2x ports                                                                                               |
| <b>SAE J1939/CAN</b>           | 2x ports, 250/500 kbps                                                                                 |
| <b>Serial ports</b>            | 1x dedicated RS232, 1x dedicated RS485,<br>2x selectable RS232/RS485                                   |
| <b>Emergency alarm</b>         | Monitored circuit input                                                                                |
| <b>Dedicated signal inputs</b> | Run switch, odometer, reverse, front door open, rear door open, stop request, wheelchair ramp deployed |
| <b>General I/O signals</b>     | 6x unassigned inputs; 6x unassigned outputs                                                            |
| <b>Sensors</b>                 | Dedicated accelerometer for vehicle dynamics                                                           |

## POSITIONING

|                                          |                                                     |
|------------------------------------------|-----------------------------------------------------|
| <b>Constellation support</b>             | GPS, L1 band; GLONASS, L1 band FDMA                 |
| <b>Channels supported</b>                | 48                                                  |
| <b>Time to first fix</b><br>(@ -130 dBm) | Hot start: 1 second<br>Cold start: <35 seconds      |
| <b>Additional sensing capabilities</b>   | Via odometer, internal gyroscope, and accelerometer |

## AUDIO

|                                 |                                                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Speaker channels</b>         | 1x interior, 2x exterior, 1x driver handset<br>All channels 25 W into 8 Ω<br>(reduced power below 18 V DC input) |
| <b>Automatic volume control</b> | Interior and exterior                                                                                            |
| <b>PA interface</b>             | Included                                                                                                         |
| <b>Handset interface</b>        | Included                                                                                                         |
| <b>Radio interface</b>          | Via Clever Devices URLC                                                                                          |

## MECHANICAL

|                                              |                                                           |
|----------------------------------------------|-----------------------------------------------------------|
| <b>Dimensions</b>                            | 3.8" H x 9.2" W x 6.5" D<br>97 mm H x 234 mm W x 165 mm D |
| <b>Dimensions including mounting flanges</b> | 3.8" H x 11.1" W x 6.5"<br>97 mm H x 282 mm W x 165 mm D  |
| <b>Enclosure</b>                             | Plastic and powder-coated aluminum                        |
| <b>Weight</b>                                | 6.3 lbs / 2.8 kg                                          |

## ENVIRONMENTAL

|                              |              |
|------------------------------|--------------|
| <b>Operating temperature</b> | -30° – 60° C |
| <b>Storage temperature</b>   | -40° – 85° C |
| <b>Seal</b>                  | IP54         |

## QUALIFICATION

|                                 |                                                                                 |
|---------------------------------|---------------------------------------------------------------------------------|
| <b>Temperature</b>              | SAE J1455 section 4.1.3.1, 4.1.3.2;                                             |
| <b>Humidity</b>                 | ISO16750-4                                                                      |
| <b>Vibration</b>                | SAE J1455 section 4.2.3; ISO16750-4                                             |
| <b>Shock</b>                    | SAE J1455 section 4.10.4.2; ISO16750-3                                          |
| <b>Transients</b>               | SAE J1455 section 4.11.3.4; ISO16750-3                                          |
| <b>Electrical loads</b>         | ISO16750-2                                                                      |
| <b>Starting profile</b>         | ISO16750-2                                                                      |
| <b>Load dump</b>                | SAE J1455 section 4.13.2.2.1                                                    |
| <b>ESD</b>                      | SAE J1455 section 4.13.2.2.1                                                    |
| <b>Conducted emissions</b>      | SAE J1455 section 4.13.2.2.3                                                    |
| <b>Radiated emissions</b>       | SAE J1455 section 4.13.3.4.4; CISPR25<br>SAE J1455 section 4.13.3.4.1; CISPR25; |
| <b>Conducted susceptibility</b> | FCC Part 15<br>SAE J1455 sections 4.13.2.2.1, 4.13.2.2.2,                       |
| <b>Radiated susceptibility</b>  | & 4.13.3.4.5                                                                    |