

# 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

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### 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, optional cellular capability sends data over a cellular network to a central processing point.

### 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

Voltage	24 V DC nominal; 9 – 36 V DC range
Current draw (@ 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 85 mA during low power mode
Protection	Reverse polarity and overvoltage
Uninterruptible power	Integrated; ~30 second holdup time
Supply	6 A synchronized with run switch
Switched power output	6 A synchronized with IVN5 wake/sleep 8 A combined maximum across both

## COMPUTING

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

## NETWORKING

Ethernet ports	2x Gigabit (1000/100/10Mbps) 4x 100/10Mbps
WiFi	Optional 802.11 a/b/g/n/ac, internal
Cellular	Optional LTE modem, internal

## VEHICLE INTERFACE

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

## POSITIONING

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

## AUDIO

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

## MECHANICAL

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

## ENVIRONMENTAL

Operating temperature	-30° – 60° C
Storage temperature	-40° – 85° C
Seal	IP54

## QUALIFICATION

Temperature	SAE J1455 section 4.1.3.1, 4.1.3.2; ISO16750-4
Humidity	SAE J1455 section 4.2.3; ISO16750-4
Vibration	SAE J1455 section 4.10.4.2; ISO16750-3
Shock	SAE J1455 section 4.11.3.4; ISO16750-3
Transients	ISO16750-2
Electrical loads	ISO16750-2
Starting profile	SAE J1455 section 4.13.2.2.1
Load dump	SAE J1455 section 4.13.2.2.1
ESD	SAE J1455 section 4.13.2.2.3
Conducted emissions	SAE J1455 section 4.13.3.4.4; CISPR25
Radiated emissions	SAE J1455 section 4.13.3.4.1; CISPR25; FCC Part 15
Conducted susceptibility	SAE J1455 sections 4.13.2.2.1, 4.13.2.2.2, & 4.13.3.4.5
Radiated susceptibility	SAE J1455 sections 4.13.3.4.2