Application

The Evolution Controls Bluetooth® Control Unit, ECM-BCU, provides a means to wirelessly adjust the output of an EC Motor. The EC motors are fractional horsepower fan motors featuring an internal microprocessor to provide exceptional efficiency, performance and motor life. The ECM-BCU allows adjustment of the airflow index\(^1\) from 0 to 100% between the manufacturer's programmed minimum and maximum airflow to maintain a constant airflow.

A green LED provides the power and the control output status by continuously flashing out the flow control output percentage.

The mobile app, EVO Devices, running on Android mobile phones or tablets, connects with the ECM-BCU control unit to configure and monitor the motor through the Bluetooth wireless connection.

Features

- Bluetooth\(^\circledR\) wireless technology for easy access at hard to reach locations
- Adjustable and Scannable RPM alarm
- Access Protection
- PWM\(^2\) or 0 to 10 V Output
- Pilot Pulse Enable/Disable
- Secured Wireless Feature Update

Ordering

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<th>Code</th>
<th>Description</th>
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<tr>
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<td>Control without plate</td>
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<tr>
<td>EVO/TM ECM-BCU-MP</td>
<td>Control with plate</td>
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Accessories

<table>
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<tr>
<th>Code</th>
<th>Description</th>
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<tr>
<td>EVO/TM ECM-CBL-??</td>
<td>EC Motor control cable.</td>
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<tr>
<td>EVO/TM USM-CBL-??</td>
<td>US Motor control cable.</td>
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<tr>
<td>EVO/TM ECM-PBL-??</td>
<td>Power Cable.</td>
</tr>
<tr>
<td>EVO/TM ECM-SBL</td>
<td>3' serial communication cable for configuration</td>
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</table>

EVO/TM ECM-BCU Specifications

Power

- ~24V ±20% 50/60 Hz NEC Class\(^2\) USA
- +24V NEC Class 2 USA
- 2 W, 4 VA + 1 VA/Motor

Outputs

- Go: +15V @ 10 mA
- Motor Control (See Motor Settings section)
  - PWM: +15V @ 10 mA
  - 0 to +10 VDC @ 10 mA
  - PWM Supports Pilot Pulse (Autoswitch) Function

Input

- Motor RPM: 0-2000 RPM ± 1 RPM
  - 36 ppt or 18 ppt

Adjustable and scannable out-of-window RPM alarm

(See Motor Settings in EVODevices Mobile App section)

Therm.

- < 0.01%/°F

Stability

- Operating Environment: 0°F to 130 °F (-18°C to 55°C)
- 10-80% rh

Wired

- Serial port with proprietary Communication command set

Radio

- Receive Sensitivity: -92 dBm sensitivity
- Output Power: +3 dBm
- Range: 50 m (150ft)

(Actual range may vary depending on the mounted location)

1 Flow index = %PWM except at the end points when the pilot pulse is enabled.

2 Pulse Width Modulation (PWM) = Vspd

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Bluetooth® Control Unit

Mobile Device Requirements

Platforms: Android phones or tablets
Operating System: Android Ver 7.0 or higher
Bluetooth: Ver 4.2 or higher

Operation

ECM-BCU

A 4-wire control cable connects each ECM-BCU to an EC motor. The motor control output signal can be 0-10V or 0 to 100% PWM. All controls are shipped with the same device name, ECM-BCU. In applications with more than one controller, each ECM-BCU must be renamed with a unique device name.

When powered up, the green LED stays on for three seconds, then continuously indicates the flow index. After a pause, the lamp flashes out the tens digit, then the units digit of a number between 0 to 100%. Long flashes represent the tens digit, and short flashes represent the units digit. For example, a flow index of 23 flashes two longs, then three shorts. A steady heartbeat of flashes indicates a flow index of 0. An extra-long flash and ten short flashes indicates a flow index of 100.

The LED turns solid green when the ECM-BCU is connected to the EVO Devices mobile app.

For data security, the ECM-BCU only pairs with the EVO Devices mobile app providing three levels of access protection.

- Read only – These are data that allow read only without authentication
- User Password Authentication – This level allows the user to read and write motor settings.
- Admin Password Authentication – This level allows the user to read and write all data.

User and admin passwords are disabled by default from the factory. They can be enabled according to the need of the application.

The RPM from the motor is continuous monitored and an alarm is set when the RPM is outside the normal thresholds. See Motor Settings for RPM Alarm threshold settings.

Wire Communication

The Evolution Control’s BT Configurator Windows® software can be used to speed up the commissioning process; for example, re-naming the ECM-BCUs before installation. A ECM-SBL cable is used to connect between a PC’s USB port and the controller’s serial port.

EVO Devices Mobile App

EVO Devices runs on Android phone or tablet mobile devices. It can be downloaded from Evolution Controls website, gotoevo.com. See the end of this datasheet for the apk installation guide.

Phone Platform

When the app is running on the phone, the first screen contains the SCAN and CONNECT buttons. The CONNECT button is initially disabled.

Press the SCAN button to discover all ECM-BCU units operating within the mobile device’s signal range. The app will continue to scan for 60 seconds or until the stop button is pressed in the progress dialog.

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Along with the device name, each device shows the six-byte MAC address, the receive signal strength, RSSI, in dBm and a Strong/Good/Weak signal strength. Tap to select a device. The selected device will be highlighted as shown below in the List View for connection.

Selecting a device in the List view enables the CONNECT button. Press the CONNECT button to start connection and pairing to the select device. The display will switch to the Motor Control view.

Devices in RPM alarm are in red. In the sample screen shot below, ECM-BCU-Pharmacy is shown in RPM alarm. RPM alarm thresholds can be configured in the motor settings view of each device, See Motor Settings section.

Device Type – The type of Evolution Controls Bluetooth device. Read only.

Device Name – A unique name for the device. It is an editable text box. The maximum length is 20 characters. It is protected by the Admin password if the password is enabled. Tap the device name edit box to bring up the virtual keyboard. When finished, press the Done key to send new name to device.

Motor Status - Running or Stop. Read only.

Motor Speed – the RPM display from the motor tachometer feedback. Read only.

Flow Index – motor flow index display between 0 to 100%. Read only. The factory default flow index is 50%.

Flow Index slider and < > buttons - flow Index adjustment controls. Tap or drag the slider for large adjustment and arrow buttons for fine adjustment. The user will need to have either user or admin privilege to change the flow index if the passwords are enabled.

“2.017” – device version. Read only. The first digit is the version. The digits after the decimal point are the
Motor Settings button – Press to open the motor settings view. The user must have user or admin privilege to access the motor settings if the passwords are enabled.

Security Settings button – Press to open the security settings view. The user must have admin privilege to access the Security Settings if the passwords are enabled.

Device RSSI – Device receive signal strength

Mobile RSSI – Mobile device received signal strength

Signal Strength – Display strong, good or weak according to the received signal strength

Press the back button, ← or ↩, located on the device to disconnect and return to the List view.

Security Settings

Press the Security Settings button to access the security settings. The user must have the Admin password to access the security settings. The Admin password authentication dialog will pop up for user to enter the password.

User and Administrator Password edit boxes are disabled until the corresponding password is enabled. When enabled, tap the password edit box to bring up the virtual keyboard. When finished, press the Done key to send the password to the controller. The default User password is password and the default Admin password is admin. The Passwords are case sensitive.

Press the back button, ← or ↩, located on the device to return to the Motor Control view.

Motor Settings

Open the Motor Settings view by pressing the Motor Settings button. Use either the User or Admin password to access the motor settings. When enabled, the password authentication dialog will pop up. Enter either the correct User or Admin password to access the Motor Settings view.
After the User or Admin password has been authenticated, the screen will switch to the Motor Settings view.

**RPM Type** – 36 or 18 Pulses Per Turn (PPT). For example, select 18 PPT for Symax-i56 motor and select 36 PPT for EON, ECM 2.3 or higher, PerfectSpeed motor. Check motor provider for the RPM type to use. The factory default is 36 PPT.

**Output Type** – Select between PWM or 0 to +10V motor control. The factory default is PWM.

**Pilot Pulse** - PWM operates between 0.4% and 99.6%. Enable pilot pulse when the motor profile allows the motor to run in an alternate mode when there is no pulse on the PWM input. The factory default is Disable.

**RPM Alarm** – This is an out-of-window alarm. The alarm status is reported in the SCAN List. The normal window is between the Alarm High and Alarm Low thresholds. The device is in alarm when the motor RPM is above the Alarm High or below the Alarm Low thresholds. The alarm is cancelled automatically when the RPM returns to within the thresholds.

The factory default of the RPM Alarm is Disable. Enabling the RPM Alarm will enable the Alarm High and Alarm Low edit boxes.

**Alarm High** – The RPM alarm high threshold. The default is 2000. The device is in RPM alarm when the motor RPM is above this threshold. It is disabled by default. Tap the Alarm High edit box to bring up the virtual numeric keypad. When finished, press the Done key to send the new value to the controller.

**Alarm Low** – The RPM alarm low threshold. The default is 0. The device is in RPM alarm when the motor RPM is below this threshold. It is disabled by default. Tap the Alarm Low edit box to bring up the virtual numeric keypad. When finished, press the Done key to send a new value to the controller.

Press the back button, or , located on the device to return to the Motor Control view.
Tablet Platform

The EVO Devices runs on a tablet platform in a dual pane layout with the List view always on the left and the Motor Control and its child views on the right.

The app runs the same way as in the phone. The CONNECT button is disabled after the app has connected to a device. When the user selects a different device from the device list, the app will disconnect from the current device, clear the right pane and re-enable the CONNECT button to get ready to connect to the new selected device.

Password Recovery

Password recovery allows the user to recover the passwords. It is activated when the controller detects the state of the two pins, highlighted below, changes from open to close.

Inserting a jumper to activate the password recovery. If a jumper is already inserted, first pull it out to open the pins, then re-insert to close. After the jumper is detected, the green LED flashes rapidly for 5 sec. before the password recovery is activated. If the jumper is removed within the 5 sec., the password recovery is cancelled. When the 5 sec is done, the green LED will then return to normal operation, flashing out the flow index output. The passwords are disabled so the user can access the Security Settings to read the passwords.

Passwords are encrypted in the recovery process and stay encrypted in the app.

Reminder: re-enable the passwords after you are done reading the passwords.
Motor Profiles

Motor profiles are unique to each manufacturer and motor. Refer to the motor manufacturers instructions to develop the motor profile. The following are a few considerations important to operation with the ECM10-BTH1:

☑ PWM or 0 -10V control
☑ Status to RPM only
☑ Motor start/stop points if motor does not use the GO signal from the ECM-BCU for the on/off control.

Mounting

Mount the controller with clearance for the power wires and control cable connector. The mounting post must be fastened to an earthed metal surface. The transformer may be located near the motor or near the control.

When mounted inside an enclosure, the ECM-BCU must not be entirely enclosed. The faceplate must be visible from the outside. In general, the signal is strongest in the direction which the faceplate is facing.

The label “Contains FCC ID:DOQBGM113” must be in a visible area.

Mounting Plate Dimensions
Wiring

Power the EVO/™ECM-BCU controller with a ~24V NEC UL 1310 Class 2 USA power source. DC voltages from +20V to +30V may also be used to power the control. Observe all code requirements and follow all safety practices regarding low voltage power supplies and circuits to insure a safe, reliable installation.

Earth one side of the power source. Connect the neutral connection to the earthed side of the ~24V Class 2 power source. Earth the negative when DC power supplied is used.

Some applications may require an isolated power supply or alternative earthing scheme. Follow code requirements and observe all safety practices concerning unearthed low voltage circuits.

Factory Defaults

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Index</td>
<td>50%</td>
</tr>
<tr>
<td>User Password</td>
<td>password</td>
</tr>
<tr>
<td>Admin Password</td>
<td>admin</td>
</tr>
<tr>
<td>RPM Type</td>
<td>36PPT</td>
</tr>
<tr>
<td>Output Type</td>
<td>PWM</td>
</tr>
<tr>
<td>Pilot Pulse</td>
<td>Disable</td>
</tr>
<tr>
<td>RPM Alarm</td>
<td>Disable</td>
</tr>
<tr>
<td>RPM Alarm High</td>
<td>2000 RPM</td>
</tr>
<tr>
<td>RPM Alarm Low</td>
<td>0 RPM</td>
</tr>
</tbody>
</table>

Connect the ~24V or +24V connection to the hot side of the Class 2 power source. You may interrupt this connection to turn off the controller and stop the EC Motor. Many automation controllers will power the ECM-BCU controller directly from an on/off output.

One end of the control cable is fitted with a 4-pin connector. Fit this connector into the mating socket on the edge of the EVO/ECM-BCU controller. Plug the connector in with the cable exiting away from the board.
Download apk

The app’s installation zip file is available from the gotoevo.com/ec-motor-controls-data web page. The easiest way to install the app is downloading the zip file directly into the mobile device. Simply press the Android App button in the web page to download the zip file to your phone or tablet.

Extract the apk file from the zip file in your favorite file management app. The My Files app is used in this example. You will find the zip file in the Recent files folder.
Tap the apk file to start installation. See the Install apk section below for the installation process.

If the apk zip file is download using your PC, the zip file should be in the Downloads folder. Right click the zip file. Use Extract All to extract and save the apk to your PC (note where it is saved).

If you have an OTG adaptor, the easiest way is to copy the apk to a USB memory stick from your PC and then connect the memory stick to your Android tablet or phone using the OTG adaptor. Otherwise, follow the steps here to download the apk from your PC to your Android tablet or phone using a USB cable.

1. Connect your mobile device to the PC using a USB cable

2. If this is the first time the PC and tablet are connected, a dialog will pop up on the tablet for permission to access the tablet files from the PC. Allow the PC to access the tablet files.

3. Click the mobile device in the Windows File Explorer to open the folder. Double click the device icon on the right to open the disk drive. In this example, Galaxy Tab A is the mobile device and the Tablet on the right is the disk drive.

4. Copy and paste the apk into the Download folder

5. In the mobile device, look for your favorite file manager app in your mobile device. The My Files app is used in this example.
6. Tap to launch the My Files app

7. The apk should appear under the Recent files or Installation files under Categories.

8. The apk can also be found in the Installation files folder.

Install apk

1. Tap the apk to start the installation. The following dialog pops up for permission to install app from unknown sources. Tap **SETTINGS**

2. Tap the switch on the right to allow installation of app from unknown source.
6. The app asks permission to access device's location. The app does not track the mobile device location, but it uses some Android location functions for scanning purpose. You must tap **ALLOW** so that the app can scan correctly. However, the Location setting in the mobile device does not need to be enabled if you don’t want your location to be tracked.

![Image of Bluetooth® Control Unit](image)

7. The app displays the normal operation screen.

![Image of EVO/™ECM-BCU](image)

8. Click the three vertical dots on the upper right corner to open the app menu

9. Tap **About** to check the version. The version should match the latest release version.

10. The app version appears for a short time at the lower part of the screen.

11. Make sure the ECM-BCUs are powered up

12. Tap the **SCAN** button and your device should appear on the List view. The app will continue to scan for 60 seconds or until the stop button is pressed in the progress dialog.