



UNIVERSITY OF  
MARYLAND



# **Environmental Control Units. ECU**

EDUC 477/6890

Devices Part III-C



# ECUs



- Visit the links below for an introduction overview of environmental control units
- What is an ECU?
- Basic Information about environmental control units



# ECU examples



- TV or stereo remote control
- Garage door opener
- Remote control for locking or unlocking our cars



# ECUs



- Composed of a combination of hardware, software, and an appliance.
- At a minimum, an ECU system consists of:
  - A control and broadcast unit
  - A receiver unit
  - A method of transmitting remote signals to the receiver
  - An appliance

# Types of ECUs



- An ECU may be
  - **simple** (switching an appliance on or off)
  - **complex** (incorporates multiple functions such as increase or decrease volume, channel up or channel down commands, etc.)



# ECUs



- Typically use one of four basic control methods:
  - **Infrared (IR) Control Unit**
  - **Ultrasonic Control Method**
  - **Radio Frequency (RF) Control Method**
  - **AC Power Line Control Method**



# Infrared (IR) Control Unit



- Infrared transmission is a common form of ECU control.
- We use IR when we attempt to operate most TV, VCR, and stereo remote controls.
- Infrared control units are wireless and send pulses to the receiver which converts these optical signals to control codes. These codes are used to operate the appliance.



# Infrared (IR) Control Unit



## Disadvantages:

- ECUs that use infrared methods are characterized by line-of-sight transmission.
  - the receiving unit must "see" the control unit in order for the user to operate the appliance. Receivers that are not within the unit's range, or its angle of broadcast, will not be able to control their respective appliance.
- Each device, and the accompanying remote control, use a different set of IR signals.
- Any obstruction (objects or persons) will block the transmission of the IR signal.
- Since the IR signal uses light as a transmission method, some IR ECUs do not work well in bright sunlight.

## Advantages:

- IR is a commonly used, and therefore flexible, control method.
- Many of the control codes used by appliances can be converted to IR signals.
- IR systems can be produced fairly cheaply and are quite portable



# Ultrasonic Control Method



- Ultrasonic devices are another wireless system that uses very high frequency sounds (beyond the auditory spectrum of the human ear). Ultrasonic transmission is non-directional and, when it encounters a solid object, will bounce around the room for a finite amount of time. Once an ultrasonic receiver recognizes the control signal, the command is completed.



# Ultrasonic Control Method



## Advantages:

- Ultrasonic ECU systems use through-the-air transmission methods and are portable.
- Signals are not as sensitive to interference as with RF transmission.
- The user does not need to face the device they are attempting to control.

## Disadvantages:

- Ultrasonic transmission may be blocked by solid objects or absorbed by porous surfaces.
- The user must be in the same room as the device they are attempting to control.
- Systems that use ultrasound are often limited to 4-8 channels (i.e., they can only operate 4-8 devices or appliances).



# Radio Frequency (RF) Control Method



- Used to operate appliances such as garage door openers, to unlock their vehicle, and when you use a portable phone.
- Instead of using invisible light, ECUs that use RF control schemes --to remotely control appliances broadcast radio waves to the receiving unit.
- These systems are also wireless.



# Radio Frequency (RF) Control Method



## Advantages:

- RF signals penetrate walls, objects, and persons. Therefore, you are not restricted to line-of-sight transmission.
- The user of an RF system need not be in the same room as the device or appliance they are attempting to operate.
- RF signals can be broadcast over long distances (often up to 200 or more feet).
- Due to the application of RF controls in other areas, this is a quite flexible control method.
- RF control units are quite portable.

## Disadvantages:

- RF signals may be subject to interference from other RF emitting devices (garage door openers, remote locking mechanisms, radio, lighting, etc.). This is true of all commercially applied RF control units. Units that have been produced specifically for persons with disabilities use a bandwidth that has been set aside for assistive devices and often are not subject to interference.



# AC Power Line Control Method



- AC power line systems are tethered systems.
- The control and/or broadcast unit is physically connected (i.e., plugged) into the AC wiring of the user's environment(s).
- The control signals are digital pulses of electricity that are broadcast through the electrical wiring of the home, office building, etc. to the receivers and their respective appliances.



# AC Power Line Control Method



## Advantages:

- AC control units do not require installation. The control unit can be plugged directly into a wall outlet and will use the existing electrical wiring.
- Generally, the user is not restricted to the room where the appliance they want to control is located.

## Disadvantages:

- AC control systems are tethered systems. That is the user cannot carry the control and/or broadcast unit around with them.
- Since AC systems use the household wiring, they are subject to electrical interference and disruption.
- If the building has multiple circuits, AC systems require one control unit for each circuit.



# What types of ECU units are there?



- There are many different types of ECUs.
- They come in all types, varieties, and have the full range of control functions.
- Some ECUs are fairly simple and would be categorized as low-tech;
- others are much more complex and perform multiple functions.



# Simple to Complex ECU Units



- See the Washington AT Alliance for some examples of simple to complex ECU units

[Washington AT Alliance - ECUs](#)



# High-Tech ECUs

- High-Tech ECUs control many devices and can do so through a variety of input mechanisms.
- Visit the following site to see some high-tech ECUs.

[Simplicity Products](#)