Auto gear changer

Introduction: An automatic gear change device includes a first actuator operation control circuit for controlling the operation of a first actuator, a second actuator operation control circuit for controlling the operation of a second actuator, and a main control circuit for controlling the operation of the first and second actuator operation control circuits. The device further includes a communication line interconnecting the first and second actuator operation control circuits to thereby enable data transmission/reception between each operation control circuit and the main control circuit through the other actuator operation control circuit and the communication line

An **automatic gearbox** is one type of [motor vehicle](http://en.wikipedia.org/wiki/Motor_vehicle) [transmission](http://en.wikipedia.org/wiki/Transmission_(mechanics)) that can automatically change [gear ratios](http://en.wikipedia.org/wiki/Gear_ratio) as the vehicle moves, freeing the driver from having to shift gears [manually](http://en.wikipedia.org/wiki/Manual_transmission). Most automatic transmissions have a defined set of gear ranges, often with a [parking pawl](http://en.wikipedia.org/wiki/Parking_pawl) feature that locks the output shaft of the transmission.

Similar but larger devices are also used for heavy-duty commercial and industrial vehicles and equipment. Some machines with limited speed ranges or fixed engine speeds, such as some [forklifts](http://en.wikipedia.org/wiki/Forklift) and [lawn mowers](http://en.wikipedia.org/wiki/Lawn_mower), only use a[torque converter](http://en.wikipedia.org/wiki/Torque_converter) to provide a variable gearing of the engine to the wheels.

1. An automatic gear change device for controlling the operation of a gear transmission and a clutch, said clutch for engaging and disengaging said gear transmission, said device comprising:

a first actuator connected to said clutch, said first actuator operating said clutch in response to a first actuator signal;

a second actuator connected to said gear transmission, said second actuator operating said gear transmission in response to a second actuator signal;

a first actuator operation control means, connected to said first actuator, for outputting said first actuator signal in response to target data;

a second actuator operation control means, connected to said second actuator, for outputting said second actuator signal in response to said target data;

a main control means, connected to said first actuator operation control means by a first signal path and connected to said second operation control means by a second signal path, for outputting said target data;

a communication means for electrically interconnecting said first actuator operation control means and said second actuator operation control means;

a first stroke sensor connected to said first actuator and said first actuator operation control means, said first stroke sensor outputting to said first actuator operation control means a first position signal in accordance with a stroke of said first actuator; and,

a second stroke sensor connected to said second actuator and said second actuator operation control means, said second stroke sensor outputting to said second actuator operation control means a second position signal in accordance with a stroke of said second actuator;

wherein a first electrical signal path is established between said main control means and said first actuator operation control means through said second signal path and said second actuator operation control means and said communication means when said first signal path is inoperative;

wherein a second electrical signal path is established between said main control means and said second actuator operation control means through said first signal path and said first actuator operation control means and said communication means when said second signal path is inoperative; and,

wherein said first and second actuator operation control means respectively output first and second position data to said main control means, said first and second position data respectively corresponding to said first and second position signals.

2. An automatic gear change device as claimed in claim 5, said first actuator operation control means comprising:

a decoder for converting said target data received from said main control means into corresponding electrical signals;

a variable gain regulator connected to said decoder for converting each of said electrical signals to a corresponding signal having a predetermined voltage level;

a pulse-width modulator connected to said variable gain regulator for modulating the pulse-width of said signal having a predetermined voltage level and for supplying the thus generated modulated signal to said first actuator; and

an encoder connected to said first stroke sensor for outputting said first position data in response to said first position signal.

3. An automatic gear change device as claimed in claim 1, wherein said first actuator operation control means comprises a switching unit for selectively establishing an electrical signal path between said main control means and said first actuator operation control means, and between said second actuator operation control means and said first actuator operation control means.   
  
4. An automatic gear change device as claimed in claim 2, wherein said first actuator operation control means further comprises a switching unit for selectively establishing an electrical signal path between said main control means and said first actuator operation control means, and between said second actuator operation control means and said first actuator operation control means.   
  
5. An automatic gear change device as claimed in claim 4, wherein said first actuator operation control means further comprises a central processing unit for controlling the operation of said decoder, said variable gain regulator, said pulse-width modulator, said encoder, and said switching unit. 

**Description:**

BACKGROUND OF THE INVENTION

1. Field of the Invention:

The present invention relates to an automatic gear change device for controlling the operation of a gear transmission and a clutch in an automotive vehicle.

2. Description of the Prior Art:

One example of automatic gear change devices of the type described is disclosed in Japanese patent laid-open publication No. 61-192954 in which two actuators for manipulating a clutch and a gear transmission are controlled based on the control signals issued from a single control unit. The control unit is mainly composed of a microprocessor operable to determine the control signals based on input signals representing various travelling condition data including the vehicle speed.

The disclosed device is disadvantageous, however, in that the control unit and the actuators have a low compatibility with the corresponding components in an automobile of a different type.

With this difficulty in view, a somewhat successful device has been proposed in Japanese patent application No. 61-154339 filed by the present assignee. The proposed device includes an actuator operation control unit which takes over a portion of the function of the conventional main control unit, and a main control unit for controlling the actuator operation control unit, the actuator operation control unit being disposed adjacent to each actuator for controlling the operation of the latter.

The foregoing device is still unsatisfactory, however, in that since the actuator operation control units are connected to the main control unit by exclusive connecting lines, they are likely to runaway when the exclusive connecting lines are damaged or broken away.

Block diagram:

Micro controller

8051

AT89C51

16X2 LCD

Crystal

sensor

Gear box

Changer

system

Motor

Driver

ckt