Code Converters

Gray to Binary Conversion.   To convert from Gray code to binary, a similar method is used, but there are some differences. The following rules apply:

1. The most significant digit (left-most) in the binary code is the same as the corresponding digit in the Gray code.

2. Add each binary digit generated to the Gray digit in the next adjacent position. Disregard carries. Again, this is an exclusive-OR addition.
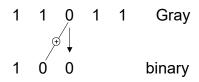
For example, the conversion of the Gray code number 11011 to binary is as follows:
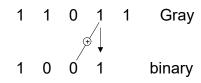
Step 1. The left-most digits are the same.

$$1 \quad 1 \quad 0 \quad 1 \quad 1 \quad \text{Gray}$$

$$1 \qquad\qquad\qquad \text{binary}$$

Step 2. Add the last binary digit just generated to the Gray digit in the next position. Discard carry.

$$1 \quad 1 \quad 0 \quad 1 \quad 1 \quad \text{Gray}$$

$$1 \quad 0 \qquad\qquad\quad \text{binary}$$

Step 3. Add the last binary digit generated to the next Gray digit.

$$1 \quad 1 \quad 0 \quad 1 \quad 1 \quad \text{Gray}$$

$$1 \quad 0 \quad 0 \qquad\qquad \text{binary}$$

Step 4. Add the last binary digit generated to the next Gray digit.

$$1 \quad 1 \quad 0 \quad 1 \quad 1 \quad \text{Gray}$$

$$1 \quad 0 \quad 0 \quad 1 \qquad \text{binary}$$

Step 5.   Add the last binary digit generated to the next Gray digit.

$$1 \quad 1 \quad 0 \quad 1 \quad 1 \qquad \text{Gray}$$

$$1 \quad 0 \quad 0 \quad 1 \quad 0 \qquad \text{binary}$$

G_3 G_2 G_1 G_0

Gray code number

MSB   LSB

Binary number

B_3 B_2 B_1 B_0

Four-bit Gray-to-binary converter

The E6CP-____ encoder has a Gray binary output. This is different from standard HEX or BCD output. The following algorithm will convert the Gray code input connected (in this example) to channel 000, into a binary (HEX) value in channel number 016. It will then convert (scale) the value from HEX angle to HEX analog output to the following parameters:

00 HEX = 00 degrees = 000 HEX analog output = 4mA
40 HEX = 90 degrees = FFF HEX analog output = 20mA

This is sample code only, and is not meant for field use.
Omron accepts no responsibility/liability for the use or misuse of this sample code.

```
00018    01605        00004                      ( 01604 )
         ┤├          ┤/├

         ┤/├          ┤├
         01605        00004


00024    01604        00003                      ( 01603 )
         ┤├          ┤/├

         ┤/├          ┤├
         01604        00003


00030    01603        00002                      ( 01602 )
         ┤├          ┤/├

         ┤/├          ┤├
         01603        00002


00036    01602        00001                      ( 01601 )
         ┤├          ┤/├

         ┤/├          ┤├
         01602        00001


00042    01601        00000                      ( 01600 )
         ┤├          ┤/├

         ┤/├          ┤├
         01601        00000
```