

# SYNCHRONOUS OUTPUT



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## A Motorola Low-Level Driver Component

The Synchronous Output driver transmits data to one or more external devices via a serial protocol, using a single clock line common to all devices in the system, and one data line per device. The driver supports up to 15 data lines. Both the clock and data lines are outputs from individual TPU channels.

API function calls control the activity of the clock and data channels. All TPU channels associated with the Synchronous Output driver are output signals only; the driver receives no feedback from the external devices receiving the data.

### Transmission Protocol

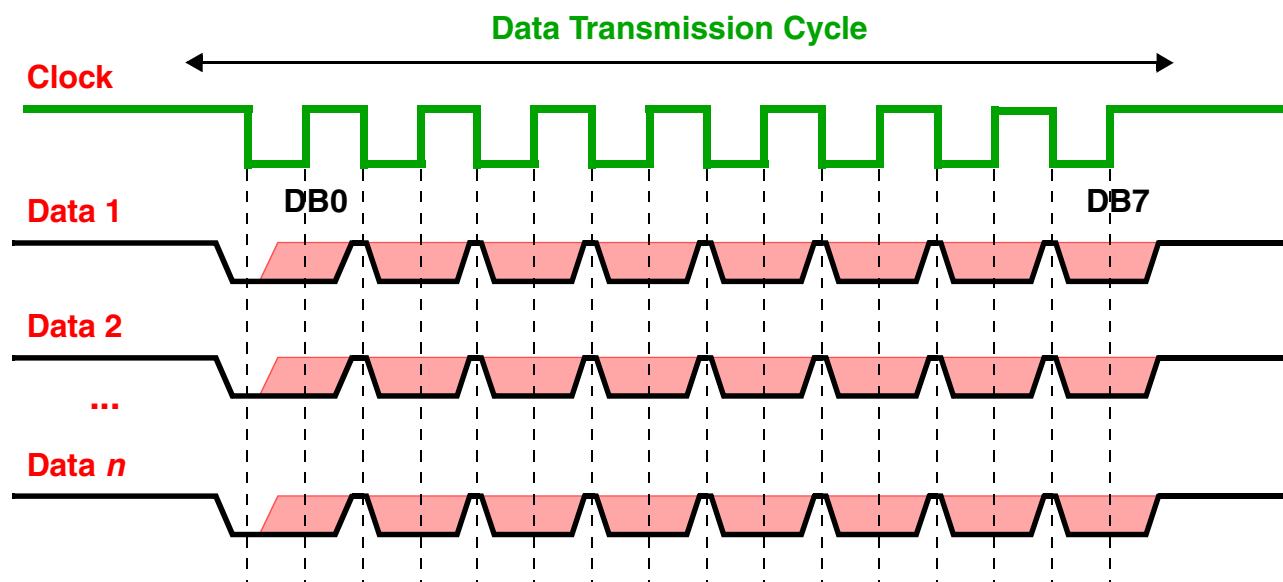
The Synchronous Output driver uses a serial protocol that addresses the external devices by using both the falling and rising edges of the

clock.

The driver selects a particular receiver by setting its data line low during a clock falling edge. The driver then transmits up to, and including, 16 bits by driving the data pin to the desired value on clock rising edges and holding the data pin high on falling edges.

The receiver device should latch the data on clock rising edges. The driver maintains the clock line and the data line in the high state except during the actual transmission.

The diagram below illustrates the transmission cycle for an 8-bit data transmission. The data transmission can be divided into the following steps:



1	After initialization, the driver drives the pins of the clock channel and all data channels high.
2	Upon receiving a send request, the driver drives the pin of each selected data channel low.
3	The driver then drives the clock channel's pin low to indicate the start of data transmission.
4	Data flow begins, in LSB-MSB order. The driver transmits each data bit coincident with a rising clock edge.
5	The driver holds each data channel's pin high between data bits (during the falling edges of the clock).
6	The driver drives the data channels' pins high after completion of the transmission.

## The Low Level Driver System

The Low Level Driver system includes a set of drivers with an API that interfaces to and controls the hardware for a microcontroller unit (such as the Motorola MPC555)

### Engine Position

Tracks the angular position in the engine cycle based on input from an automobile's crankshaft and camshaft sensors

### Spark & DTS

Generates pulses defined by duration and end angle; can be used to time the firing of spark plugs

### Fuel

Generates pulses immediately upon request or defined by duration and end angle; can be used to control fuel injection duration and frequency

### Speed Measurement

Determines the speed of a rotating shaft

### Synchronous PWM

Synchronizes an output pulse width modulation (PWM) signal to an input PWM signal

### Synchronous Output

Transmits a clock signal and serial data, following a specific protocol

### Angle Toggle

Toggles an output pin and generates interrupts on selected crank angles

### QADC Trigger

Generates pulses defined by a start angle and duration

### Knock Window

Generates pulses defined by a start and end angle

### Discrete Input/Output (DIO)

Operates as a general-purpose digital input or output pin



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