Pulse-Proportional Servo Circuit

GENERAL DESCRIPTION

The XR-2264 and 2265 are Monolithic circuits designed for use in pulse-proportional servo systems. They have been specifically designed for Radio Control applications. These devices are capable of controlling positions in direct proportion to the width of input pulses. The 2264 can interface directly with servo motors requiring up to 350mA of drive current. The 2265 with open collector outputs can drive relays, optical couplers and triacs, directly. Both the 2264 and 2265 can drive external PNP transistors for 500mA output drive requirements.

The XR-2264 or 2265, combined with a servo motor and a feedback potentiometer form a closed-loop system. These devices have internal one-shot multivibrators. The pulse width of this one-shot is controlled by the servo potentiometer. When an input pulse is applied, the motor is turned "on" in the direction necessary to make the internal one-shot pulse width equal to the incoming pulse width. Because the transfer characteristics of the XR-2264 and 2265 can be controlled by the selection of external components, it can be used in many industrial and radio controlled servo-system applications.

FEATURES

Wide Supply Voltage Range (3.0V to 6.0V)
Bi-directional Operation with Single Supply
Separately-Adjustable Dead Band and Pulse Stretching
2264 - 350mA Source and Sink on chip.
500mA with External PNP
2265 - 500mA Sink Capability on chip.
500mA Sink or Source Capability with external PNP

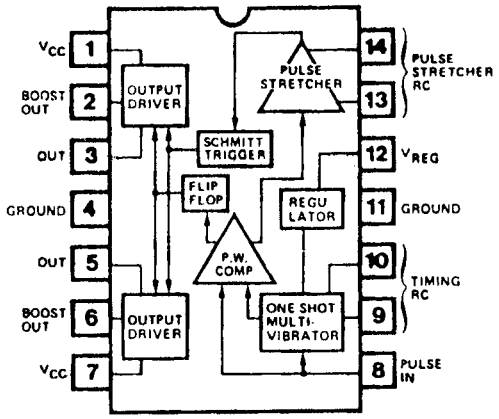
APPLICATIONS

Remote Control Toys
Robotics Applications

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	6.5V
Power Dissipation	550 mW
Storage Temperature Range	−65°C to +150°C

FUNCTIONAL BLOCK DIAGRAM



ORDERING INFORMATION

Part Number	Package	Operating Temperature
XR-2264 CP	Plastic Dual-	−10°C to +50°C
XR-2265 CP	In-Line	

SYSTEM DESCRIPTION

Figure 3 shows the circuit connection diagram for the XR-2264. The external component values shown are selected for a pulse width range of 1 to 2 msec, a frame time of 12.5 msec, and a dead band* that is suitable for use with small radio-controlled servos. However, with a proper choice of external components, the characteristics of these devices can be adapted to provide optimum performance for a broad range of hobby and industrial servo control applications.

The shaft of potentiometer R_2 is connected to the servo output shaft; the voltage on the wiper provides positional feedback to the one-shot multivibrator of the XR-2264 or 2265. The one-shot pulse width range is set by the product of R_1 and C_1; R_1 should be kept in the range of 8KΩ to 16KΩ. For operation over a range of pulse widths

XR-2264/2265

ELECTRICAL CHARACTERISTICS

Test Conditions: V_{CC} = 5.0V, T_A = 25°C

PARAMETERS	LIMIT			UNITS	CONDITIONS
	MIN	TYP	MAX		
Supply Voltage	3.2	5.0	6.5	V	
Supply Current		4.5	10.0	mA	Measured into Pins 1 & 7
Regulated Output Voltage	2.0	2.2	2.4	V	Voltage at Pin 12
Input Current		0.1		mA	
Input Voltage Range	2.4		6.0	V	
Pulse Timing Error			±300	μSec	Initial Setting 1.07 sec; Curcuit of Figure 3

OUTPUT CHARACTERISTICS

DEVICE	PARAMETER	LIMIT			UNITS	CONDITIONS
		MIN	TYP	MAX		
2264	Output Current Range	0		500	mA	I sink
	Output Current Range	0		350	mA	I source
	V_{CE}			0.25	V	I sink 500mA
	V_{CE} (V_{CC} − V_{OH})			1	V	I source 350mA
2265	Output Current Range	0		500	mA	I sink
	V_{CE}			0.25	V	I sink 500mA

of less than 2 to 1, the value of potentiometer R_2 may be reduced; the value of the 2.2KΩ resistor to ground should be increased by about the same amount.

The voltage on C_2 provides the input signal for the Schmitt trigger. In order for the motor to be driven, pin 14 must remain low, long enough to pull C_2 down to the lower threshold via R_3. The motor will be turned off only after pin 14 has turned off and C_2 has charged to the upper Schmitt trigger threshold through R_4. Thus, the dead band is controlled by C_2 (R_3 + R_i) where R_i is the "on" resistance at Pin 14. The pulse stretching is controlled by the product of C_2 and R_4. Figure 4 shows the effect of R_3 and R_4 upon the dead band and pulse-stretching performance of the XR-2264 with C_2 = 0.22μF.

**Note: The "Dead band" is the narrow region about a given shaft position which 2264 will not produce a Stretched Pulse large enough to drive the motor. Some dead band width is necessary because the motor shaft has inertia; otherwise, the motor would never stop "hunting" its target position.*

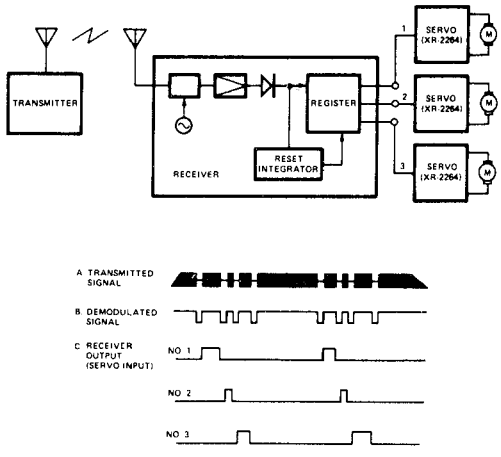
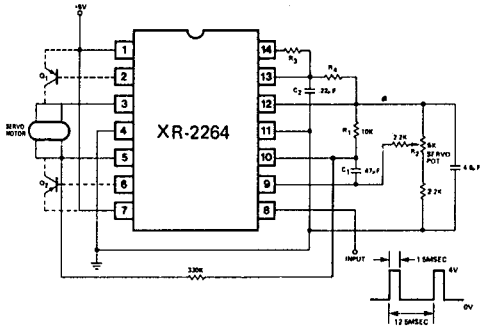


Figure 2. Radio Control System



**NOTE: XR-2264 Q_1 and Q_2 optional; only needed for Servos requiring 500mA drive current.*
***NOTE: XR-2265 Q_1 and Q_2 needed if output current source is required.*

Figure 3. Connection Diagram of XR-2264 and XR-2265 Servo Control IC

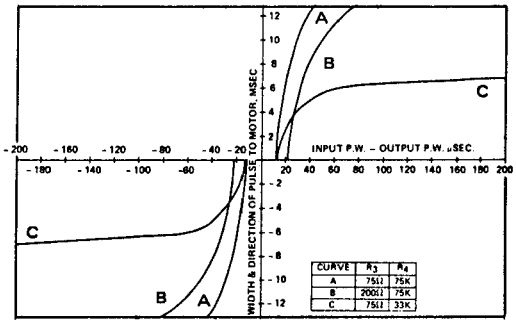


Figure 4. XR-2264 and XR-2265 Output vs. Input Showing Dead Band. Circuit of Figure 3

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