As a general guideline, if you reduce R23 by half, then time to foldback will be cut almost in half.

If you remove R23 (infinite resistance), foldback will be disabled, because v_c, the voltage on the capacitor, will never rise high enough to trigger the foldback circuit.

Resistor Selection

The following sections describe three application situations.

- ❑ High Torque Permitted / Controller Can Detect a Jam
- ❑ High Torque Not Permitted
- ❑ Controller Cannot Detect a Jam

To select foldback resistors, determine which of the situations apply to your system, and follow the instructions in the relevant section below. Compumotor OEM Series servo motors will be used as examples. If you use a motor from another manufacturer, adapt the instructions to suit your motor.

High Torque Permitted/Controller Detects Jam

If your mechanical system can withstand the peak torque of your motor with 12 amps in it, and your controller can detect a jam, you can probably use the default resistors installed in your OEM670T at the factory. These resistors allow 12 amps peak current for 0.5 – 2 seconds before foldback occurs (depending on the level of current *before* the peak), and will allow currents up to 6 amps continuously. The table below, *Default Foldback Resistors*, lists the default values.

DEFAULT FOLDBACK RESISTORS (as shipped)

RES #:	FUNCTION	VALUE	CURRENT
R25	Foldback Current	23.7 K	6 Amps
R24	Peak Current	Ø	12 Amps
R23	Time Constant	5.1 M	

To verify that these resistors are suitable for your application, test your system as described below.

If you experience undesired foldback (red LED lights, but goes out when the command input voltage is reduced), the foldback

circuit can be disabled by removing R23, the resistor that controls the thermal time constant. Even with foldback disabled, you can still limit peak current (and thus peak torque), by installing an appropriate resistor value for R24, I_{pk}. Foldback will not occur with R23 removed, however.

High Torque Not Permitted

If your mechanical system cannot withstand the peak torque that the OEM670T can produce, you can limit peak current, and thus peak torque, with R24. See the *Peak Current* table below for appropriate resistor values.

Controller Cannot Detect a Jam

If your controller *cannot* detect a jam, you should determine foldback resistor values appropriate for your application and install them in your drive. When a jam occurs with these resistors installed, the OEM670T will reduce the motor current to a lower level.

This mode of operation greatly reduces the rate of motor heating, and allows more time for the machine operator to notice that there is a problem and shut the system down. As a warning to the operator, the red LED on the front panel will be illuminated while the drive is in foldback.

If you use Compumotor OEM Series servo motors, the table below lists suggested resistors you can use to replace the default resistors shipped with the drive.

FOLDBACK RESISTORS FOR OEM SERIES MOTORS

Motor	R25. I_{fold}		R24. I_{pk}	R23. $T_{c\text{-}therm}$
2300	none	(0.75A)	Ø (12A)	1 M
2303	100 K	(2.5A)	Ø (12A)	5.1 M
3400	60.4 K	(3.65A)	Ø (12A)	5.1 M
3401	90.9 K	(2.9A)	Ø (12A)	5.1 M

These values will be appropriate for most applications. However, there are many variables that affect the actual motor operating temperature (see the list below in *Application Conditions Affect Foldback*). You may need to adjust these resistors further.

The next table gives resistor values for specific peak currents and foldback currents.

R24, PEAK CURRENT			R25, FOLDBACK CURRENT		
I_{pk} (amps)	R24		I_{fold} (amps)	R25	
3	845	K	1	1.2	M
4	450	K	2	165	K
5	348	K	3	86	K
6	249	K	4	53	K
7	182	K	5	35	K
8	124	K	6 *(Default)*	23.7	K
9	86.6	K	7	16.9	K
10	56.2	K	8	12.3	K
12	Ø	*(Default)*			

A starting point for I_{fold} is to choose R25 so that the foldback current is 70% of the motor's continuous current rating.

If you experience "nuisance" foldback where the current is reduced, but the motor is not too hot and no jam exists, try increasing the foldback current.

✳ To disable current foldback, remove R23, the resistor that controls the thermal time constant. You can still specify peak current with R24—but the drive will never go into foldback with R23 removed. Reduce R25 0-10 Ω

Application Conditions Affect Foldback

The foldback circuit is well defined, but it is a simplified, approximate model of what actually occurs in the motor. Circuit limitations and differences in application conditions can cause widely varying results.

Some conditions that affect motor temperature are:

- ❑ Ambient temperature
- ❑ Air flow on the motor
- ❑ Heatsinking of motor (size, composition, and temperature of the motor mounting surface
- ❑ Move profile and duty cycle
- ❑ Motor core losses

Other conditions may be important in your system.

Because so many variables affect the motor temperature, we recommend that you treat the suggested resistor values as a starting point in developing your motor thermal management strategy. You may need to determine the best values empirically. For optimum motor protection, choose values as conservatively as possible. Finally, test your system as described below.

Application Examples

If you have a load that is primarily frictional (for example, a spindle drive), you can set the peak current limit resistor, R24, to a value that will keep the current below the continuous current rating of your motor. This will ensure that the current cannot exceed the motor's rating. Check the motor temperature under actual operating conditions.

If you have a load that is primarily inertial (for example, a point-to-point move with low friction), you can set the foldback current resistor, R25, to a low value that will protect against a jam but still allow full peak current for the acceleration portion of the move. If the move duty cycle is low, the overall average power will also be low, even though the peak power may be quite high. Therefore, you can use a low foldback current setting.

TEST YOUR SYSTEM

Once you have selected and installed foldback resistors, you should perform two tests to verify that the foldback circuit adequately protects your motor.

- ❑ Measure Motor Temperature
- ❑ Simulate a Jam

These tests are described below.

Measure Motor Temperature

Motor manufacturers specify their products in various ways. For the most accurate information about the motor's performance in *your* application, you should measure the motor case temperature under actual operating conditions. Make your measurements after the motor temperature has reached equilibrium (which can take several hours). Compare the results with the motor's ratings. Motors from Compumotor can operate with case temperatures up to 95°C (203°F), in most circumstances.