EFJohnson

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October 15, 2007

Service Bulletin

To: All EFJohnson Customers, Dealers, and EFJohnson associates

Subject: Time Drift in IP25™ System Components

After extended operation, there is a significant drift in the time of day as indicated by various system components. This is most noticeable in the timestamps provided to the Network Management System (NMS) in alarms and log messages from site-controllers and channel-controllers.

After attempting to synchronize the time of day from a Network Time Protocol (NTP) server at start-up in 2.3.x systems and earlier, channel-controllers (CC) and site-controllers (SC) keep time independently,. If a controller fails to receive time synchronization from the NTP server, the controller will set its time of day from an on board real-time-clock (RTC).

The RTC is updated when time synchronization is received from the NTP server. The RTC receives power from a local battery, and therefore runs continuously through reboots and power outages. The only time the RTC is used is following a failed attempt to get time from an NTP server at start up.

The NTP server is hosted on the NMS, which generally has time of day set manually by a system operator. There is no additional synchronization of time amongst system components, except when a controller card is rebooted. Following system startup, all components keep time independently. Each component has its own unique sources of error.

To minimize time drift in 2.3.x systems and earlier, use the following procedure:

The majority of the time error results from drift in the RTC in the NMS server, typical of PC RTCs. By synchronizing the NMS to an external NTP server with an accurate time reference (such as TCXO, OXO, or GPS based server), the typical intra-system time precision can be reduced to less than 20 seconds/month of continuous operation. If desired, periodic maintenance resets of the Site and Channel controllers can reduce this even further.

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To minimize time drift in 3.0 systems and later, follow these steps:

1. The proper crystal for the RTC will be used at time of manufacture, reducing the error by about 100ppm.
2. The +15ppm error introduced by software in the Site controller will be corrected.
3. A highly accurate, external, NTP server (such as TCXO, OXO, or GPS based server) is a recommended option for SR3.0 and beyond for accurate and precise time.
4. Site and channel controllers will periodically synchronize time with the external NTP server during operation. This feature can be disabled, for those operators who have chosen not to purchase a high precision external time reference, and wish to rely on the accuracy of the embedded components.

Component	**Error Source**	**Error Magnitude**	**Typical Error**
Site Controller	Crystal accuracy	+/- 50 ppm (spec)	
	Software defect	+15 ppm (actual)	
	Overall		+8 ppm
Channel Controller	Crystal accuracy	+/- 2.5 ppm (spec)	
	Overall		0 ppm
Site/Channel Controller RTC	Crystal accuracy	+/- 20 ppm (spec)	
	Incorrect part # used (12.5pf vs 6.0pf crystal load)	+100 ppm (typical)	
	RTC Overall		+100 ppm
NMS	Overall		-160 ppm
NMS	Set error	Unknown and unbounded	
Site/Channel Controller	Set Error –(when no NTP has ever been available)	Time is set to 1998	

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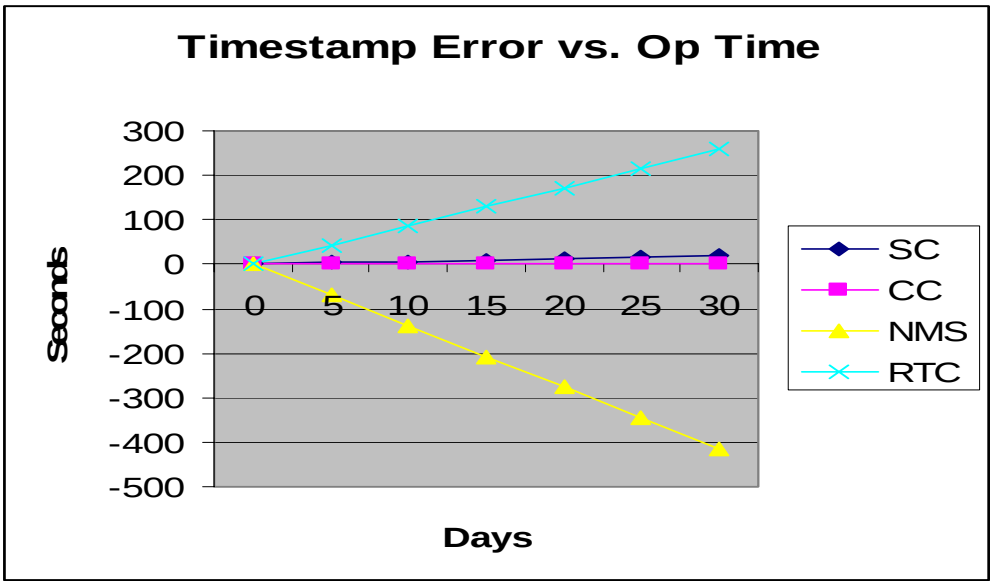
The net effect of these errors causes decreasing time precision within the system during operation. Refer to the following chart that shows a typical difference in time between the SC timestamp and the NMS time in just 30 days to be approximately 7 ¼ minutes. This assumes a 0 initial set error.



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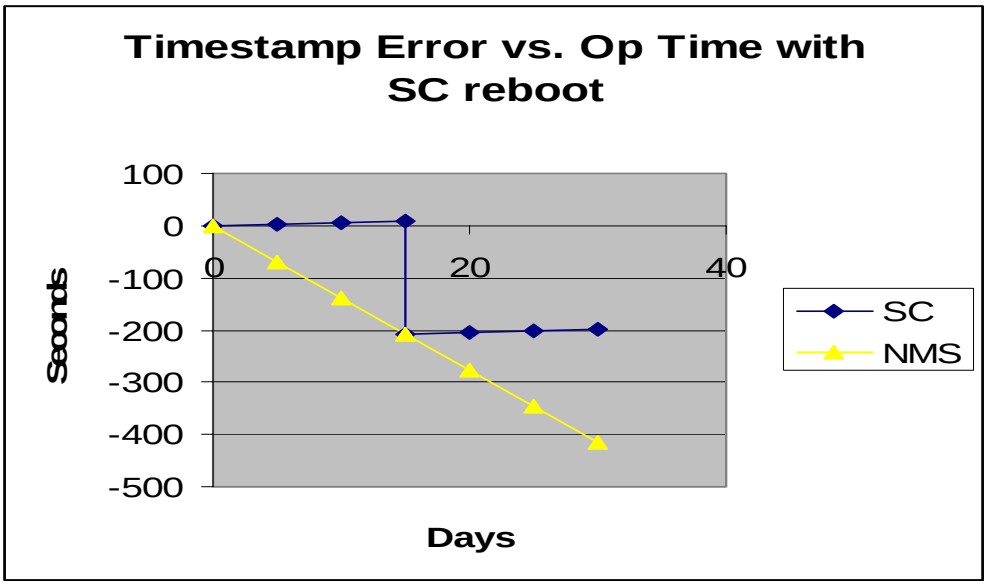
The following chart shows the effect when the SC is rebooted after 15 days, under the same conditions. Note that the difference in time between the SC and the NMS is cut approximately, in half, but now the SC error has increased significantly to approximately 3 ¼ minutes due to the re-synch to the incorrect time at day 15.



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The following table summarizes expected performance:

System version	Configuration	Approximate Time Error/90 days*
<= 2.3.x	No changes	22 minutes
<= 2.3.x	External NTP server	1 minute
<= 2.3.x	External NTP server with 30 day controller resets	20 seconds
>= 3.0	No external NTP server	21 minutes
>= 3.0	No external NTP server, (embedded side only)	15 seconds
>= 3.0	External TCXO NTP server	15 seconds
>= 3.0	External OXO NTP server	2 seconds
>= 3.0	External GPS NTP server	<2 seconds

*Error is relative to initial set point

The following resources provide additional information regarding the use of NTP.

Windows Time Service [technet.microsoft.com]
How to configure an authoritative time server in Windows XP [support.microsoft.com]

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