## 1 概述

实际应用中,S120驱动系统常会遇上这样或那样的故障,有些故障其现象很容易重现,故障原因可以很快找到,因而调试起来比较方便;而有些故障很难重现,其故障瞬间的驱动器内部或电网等数据不易捕捉,故障原因很难查找,因而调试起来比较困难。 针对此类故障,结合S120调试软件STARTER中的离线Trace功能,可以在无人监控的情况下对特定故障前后驱动器内部相关参数进行记录,以便快速而有效地进行诊断。

## 2 故障触发 Trace 功能的设置

|   | a mactive   | Drive_u   | nit_1  | Assume control priority   |      |
|---|---|---|--|---|------|
| Function ge   | nerator 1   | leasurements   Time diag  | iane all dis   | ran   Bode dagran   |      |
|   | als .   |   |  | 37  |      |
| No.   | Active  | Sinnal  | × × • •  | Comment   | Colo |
| 1   |   | SERVO_02./61[0]   | ++{ \$E  | V0_02.r61(0): Actual speed unsmoothed, Encoder 1                            |      |
| 2   |   | SERVO_02.470  | SE   | IV0_02:r70: Actual DC link voltage  |      |
| 3   |   | SERV0_02.#68  | <u></u> 58   | V0_02/66: Output frequency  |      |
| 4   |   |   |  |   |      |
| 6   |   |   |  |   |      |
| 7   |   |   |  |   |      |
| 8   |   |   | -  |   |      |
| Mean<br>Mean<br>Basic c<br>*Facto   | arding<br>raive acqu<br>ycle clock<br>t   | eition [isochronous reco<br>0.125 ma [Driv  | nding-time-lis<br>s_unit_1 )<br>1                            | ed trace  |      |
| Mean Mean Mean Mean Mean Mean Mean Mean   | arding<br>raive acqu<br>ycle clock<br>t<br>ycle cloci<br>rycle cloci  | eabor: [isochronous ieco<br>0.125 ma (Divi<br>)<br>()   | rding - time-lin<br>unt_1 )<br>0<br>682.500                  | ed Irace  |      |
| Mean Mean Mean Mean Mean Mean Mean Mean   | arding<br>calue acts<br>pole clock<br>t<br>yole clock<br>rs<br>yole clock<br>rs<br>per  | eabor: [faochronous ieco<br>0.125 ma ( Divi<br>)<br>(   | rding - time liss<br>c_unit_1 )<br>1<br>682 500              | ed Irace 🔹 🔹  |      |
| Mean<br>Mean<br>Paulo o<br>Facto<br>Trace o<br>Duratio<br>Me I Trigg  | arding<br>rake acqu<br>yole clock<br>t<br>yole clock<br>gole clock<br>rt<br>yole clock  | Rabon: [faochronous reco<br>0.125 ma ( Dive<br>)<br>*   | nding - time lis<br>c_unit_1 )<br>1<br>682 500               | ed Irace 💽<br>El constant duration: 682 500 me                              |      |
| m Reco<br>Mean<br>Pacto<br>Facto<br>Trace o<br>Duratio<br><u>m</u> Trage<br>Type:<br>Drive o                                      | arding<br>rake acq<br>pole clock<br>t<br>gole clock<br>rc<br>gor<br>per<br>bject  | Eabor: [Isochronous ieco<br>0.125 ma [Davi<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1 | nding - time-lis<br>unit_1 ]<br>0<br>682.500                 | ed linece   |      |
| Rec.     Mean     Mean     Mean     Pacto     Trace c     Duratio      mel Trigg      Type     Drive c     Cyc.ck                 | arding<br>raive acqu<br>pole clock<br>t<br>spole clock<br>ris<br>spole clock<br>ris<br>per<br>biect<br>ck   | Eabor: [Isochronous reco<br>0.125 ms [Davi<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1 | eding - time filt<br><br>0<br>682 500<br>682 500<br>H        | ed livece<br>Ed livece<br>3<br>5 me  Maximum duator.<br>682 500 me<br>4 & 5 |      |
| Reci<br>Mean<br>Paric c<br>*Facto<br>Trace c<br>Duratio<br>me I Trigg<br>Type:<br>Drive c<br>Cyc ck<br>Phetigg                    | arding<br>raive acq.<br>ycle clock<br>t<br>ycle clock<br>r<br>ycle cloci<br>r<br>ycle cloci<br>r<br>ycle cloci<br>r<br>ycle clock<br>r<br>biect<br>ck.<br>ycc | Initian: Facefromous reco<br>0.125 ma (Dave<br>)<br>(Tripper at alarm<br>SERVQ_02<br>0.125 ma (Drive_us<br>) 100                          | nding - time ilin<br>unit_1 )<br>0<br>682 50<br>#_1)<br>1000 | ed frace  |      |
| Reci<br>Meas: -<br>Basic c<br>-Facto<br>Trace -<br>Duratio<br>2mi   Trigg<br>Type:<br>Drive c<br>Cyc ck<br>Printigg<br>2mi   Diap | arding<br>rake arq<br>pole clock<br>t<br>sole clock<br>rc<br>per<br>per<br>biect<br>ick<br>per<br>fay optio   | Antion: Facchronous seco<br>0.125 ma (Delvi<br>)<br>)<br>)<br>)<br>(Trigger at elem<br>(SERVO_02<br>0.125 ma (Delve_ue<br>)<br>100        | nding - time kin<br>unk_1)<br>0<br>682 50<br>k_11<br>0000    | ed frace  |      |

图 1. 设置故障触发 Trace 功能

当设备故障时,自动触发 Trace 功能,记录相应数据曲线。步骤如下:

(1) 单击 STARTER 软件工具栏中的 图标, 激活 Trace 配置界面。

(2)选择故障前后需要记录的参数,图1中为SERVO\_2的r61[0],r70以及r66三个参数。

(3)选择基准采样周期的1倍记录数据,采样循环时间为0.125ms,总的数据记录时间 长度是682.5ms。

(4)选择"Trigger at fault"作为触发条件,驱动对象选择为"SERVO\_02"。当 SERVO\_02发生故障时,自动触发 Trace 功能,记录数据。

(5) 在预触发 "Pretrigger"中设置在触发瞬间前多少毫秒内的数据加以保留。若设置 100ms,则故障后记录数据时间为: 682.5ms – 100ms = 582.5ms。

(6) 单击▶,激活 Trace 功能。

(7) Trace 成功后,可以在"Time diagram"中查询记录波形。它会记录故障发生前 100ms 和发生后 582.5ms 内 SERVO\_02 的内部数据。

## 3 特定故障触发 Trace 功能的设置

根据上述设置,无论 SERVO\_02 发生何种故障,均会触发 Trace 功能。若当前故障不是想 捕捉的故障,此时记录的 Trace 数据就没有参考价值,因而必须在线再次点击▶,重新激 活 Trace 功能。为了仅当特定的一个或多个故障或报警出现时,才触发 Trace 功能,可以 做如下设置:

(1)确定需要捕捉的故障代码(Fault code)或报警代码(Alarm code)及所在驱动对象,如: SERVO\_02中的 F31885 故障。

(2)可在 SERVO\_02 的专家列表中设置参数 p2128.1 = 31885。一旦驱动对象 SERVO\_02 中发生 F31885 故障,则 r2129.1 被置位。

|      | ⊖ Parame_   | Data | Parameter text                            |      | Online value SERVO_0 |
|------|-------------|------|---|------|----------------------|
| NK.  | AI •        | 4.4  | AI AI                                     |      | A1                   |
| 643  | G 02128     |      | Selecting faultialarm code for trigger    | 1.00 | 13 Y                 |
| 644  | p2128(0)    |      | Selecting faultialarm code for trigger    |      | 0                    |
| 645  | p2120(1]    | 1    | Selecting faultislarm code for trigger    |      | 31865                |
| 646  | + p2128(2)  | 1.1  | Selecting faultislarm code for trigger    |      | 0                    |
| 647  | + p2128(3)  | 1    | Selecting faultialarm code for trigger    |      | 0                    |
| 648  | * p2120(4)  | 1    | Selecting faubialarm code for trigger     |      | 0                    |
| 649  | + #2128(5)  |      | Selecting faultialarm code for trigger    |      | 0                    |
| 650  | + p2128(6)  |      | Selecting faultialarm code for trigger    |      | 0                    |
| .651 | P p2128(7)  | 1    | Selecting faultialarm code for trigger    |      | 0                    |
| 652  | + \$2128(8) | 1.1  | Selecting faultialarm code for trigger    |      | 0                    |
| 653  | P p2128(W)  |      | Selecting faultistarm code for trigger    |      | 0                    |
| 454  | P #2128[10] |      | Selecting faultistarm code for trigger    |      | 0                    |
| 655  | #2128[11]   |      | Selecting faultialarm code for trigger    |      | 0                    |
| 656  | p2128(12)   |      | Selecting faultisiant code for trigger    |      | 0                    |
| 657  | * p2128(13) |      | Selecting faultistam code for bigger      |      | 0                    |
| .658 | + p2128[14] |      | Selecting faultialarm code for trigger    |      | 0                    |
| 659  | p2128[15]   | -    | Selecting faultilation code for trigger   |      | 0                    |
| 660  | @r2129      |      | CO/BO: Trigger word for faults and alarms |      | 0H                   |
| 661  | r2129.0     |      | Trigger signal p2128(0)                   |      | OFF                  |
| 662  | r2129.1     |      | Trigger signal p2128(1)                   |      | 0//                  |
| 663  | + r2129.2   |      | Tripper signal p2128(2)                   |      | OFF                  |
| 664  | + 12129.3   | 100  | Trigger signal p2128(3)                   |      | OFF                  |
| 665  | r2129,4     |      | Tripper signal p2128(4)                   |      | OFF                  |
| 666  | r2129.5     |      | Tripper signal p2128(5)                   |      | OFF                  |
| 667  | + r2129.6   |      | Tripper signal p2128(6)                   |      | OFF                  |
| 668  | r2129.7     |      | Trigger signal p2128(7)                   |      | OFF                  |
| 669  | + r2129.8   | 1    | Trigger signal p2128(8)                   |      | OFF                  |
| 670  | r2129.9     | 1    | Trigger signal p2128(9)                   |      | OFF                  |
| 671  | r2129.10    |      | Trigger signal p2128(10)                  |      | 011                  |
| 672  | r2129.11    |      | Tripper signal p2128(11)                  |      | OFF                  |
| 673  | + 12129.12  |      | Trigger signal p2128[12]                  |      | OFF.                 |
| 674  | 12129.13    |      | Trigger signal p2128(13)                  |      | OFF                  |
| 675  | 12129.14    |      | Trigger signal p2128[14]                  |      | OFF                  |
| 676  | L r2129.15  |      | Tripper signal p2128(15)                  |      | OFF.                 |

图 2. 设置故障代码

(3) 触发条件选择 "Trigger on variable – Bit pattern": 按照位匹配触发。驱动对象选择 仍为 "SERVO\_02", 在 "Par. no. / variable"中选择其中的 r2129 参数。

(4) 在右侧 Bit mask 中填入 2 Hex,表示仅取参数 r2129 bit1 位的数据。Bit pattern 中也 填入 2 Hex,表示当 bit1 位为 1 时条件匹配,则触发 Trace 功能。Bit mask 功能可以实现 对最多 16 位信息进行筛选,当多位信息与 Bit pattern 中的设置相同时可以触发 Trace 功 能。

| Fctuen              | inactive               | Drive_unit_1  |                 | U <u>Ľ</u>                              | Assume cont         | trol priority!   |                           |   |
|---------------------|------------------------|---|-----------------|---|---------------------|--|---------------------------|---|
| Function gen        | erator ) b             | leasurements   Time diagram   F                             | FT diagram ]    | Bode diagram                            |                     |  |                           |   |
| 🤐 Signa             | da 👘                   |   |                 |   |                     |  |                           |   |
| No.                 | Active                 | Signal  | 0.0000000       | 000000000000000000000000000000000000000 |                     | Comment  |                           | 000000000000000000000000000000000000000 |
| 1                   |                        | SERV0_02.r61[0]   | + SERVO_(       | 02.r61[0]: Actual (                     | peed unsmoothed, Er | ncoder 1   |                           |   |
| 2                   |                        | SERV0_02:70   | SERVO_(         | 02.r70: Actual DC                       | ink votage          |  |                           |   |
|                     |                        | SERV0_02.r66  | SERVO_          | 02.r66: Output fre                      | quency              |  |                           |   |
|                     | 223                    |   |                 |   |                     |  |                           |   |
|                     |                        | ·····   |                 |   |                     |  |                           |   |
| 7                   |                        |   | •               |   |                     |  |                           |   |
| 8                   |                        |   | ÷.              |   |                     |  |                           | -                                       |
| Meas. v<br>Basic cy | alue acq.<br>cle clock | esson:  Isschronous recording - t<br>0.125 ms [Drive_unit_1 | ime-limited tra | ¢e                                      |                     | 1  | Bit mask.<br>Bit pattern. | 0 0 2 H                                 |
|                     |                        |   |                 |   |                     |  |                           |   |
| I nace of           | icle cloci             | i l   | 0,125           | ent                                     |                     |  | XXXXXXXX D                | AXXXXXX 1X B                            |
| Duration            | r                      | 6   | 82.500-         | <b>m</b>                                | (- Maximum duratio  | n [ 68   |                           |   |
| <u></u>             | er 👘                   |   |                 |   |                     |  |                           | Carce                                   |
| Турес               |                        | Trigger on variable - Bit patte                             | en              |   | ·····               |  | Bit mask.                 |   |
| Pal. no.            | / variable             | SERVO_02/2129. CO/BO: 1                                     | rigger word f   | or lauits and alars                     | 4 🗌                 | 1 2 1 1 0  | 2.H                       | *                                       |
| De elec             |                        | 0.125 ms (Drive unit 11                                     |                 | - <b>F</b> R                            |                     |  | Bit pattern               | din.                                    |
|                     |                        | A 1 A 1 A 1 A 1 A 1 A 1 A 1 A 1 A 1 A 1                     |                 |   | A A                 | The second s |                           |   |

图 3. 设置特定故障触发 Trace

(5) 若想依靠多个故障或者报警中任意一个条件来触发 Trace 功能,可以先在 p2128.0 ~ 15 中设置故障或报警代码,结合自由功能块中的"或"逻辑,对 r2129 中的位进行逻辑综合后,再根据上述内容设置按位匹配触发。

## 4 设置离线 Trace

对于某些偶发的故障或报警,无法实现 STARTER 在线的持续监控。可以采用激活离线 Trace 的方法来解决。

(1) 在根据上述内容设置完 Trace 相关功能后,单击 ▲,见图 4,下载 Trace 功能设置;离线后即可正常运行设备。

(2) 单击 **)**, 激活 Trace 功能。

(3) 当触发 Trace 功能的相关故障发生后,可以 STARTER 再次在线,单击上载 Trace 曲线。

| < × × × <b>f</b>   | ctGen   | inactive   | Drive_unit_  | 1   | Upload curve)I priority/              |  |
|--|---|--|--|---|---------------------------------------|--|
| e Functi   | ion gene  | sator   N  | easurements   Time diagram                                 | FFT diagram Bode di   | gran   > 2 & 4                        |  |
| 333  | Signal  |  | *(*(*(*(*(*(*(*(*)   |   |                                       |  |
| 1 [  | No.   | Active   | Signal   |   | Comment                               | Color  |
|  | 1   | ~  | SERVO_02 r61[0]  | SERV0_02.r61[0]   | Actual speed unsmoothed, Encoder 1    |  |
|  | 2   |  | SERVO_02/70  |   | ctual DC link voltage                 |  |
|  | 4   | -  | 00440_02100  |   | ups nearency                          |  |
| , i  | 5   |  |  | ine interesting in the second |                                       |  |
|  | •   | 1  |  |   |                                       |  |
|  | 7   |  |  |   |                                       |  |
| <br>   | Recon   | ding<br>Ave acqu   | isilian Isochronous recording                              | g - time-limited trace  |                                       |  |
| ] <u>1991</u><br>M<br>J<br>J   | Recor<br>Asac va<br>Nasic cyc<br>Factor   | <b>ding</b><br>Aut acqu<br>Cle clock   | isition: [Isochronous recording<br>0.125 ms [Drive_un      | g - twe-limited trace   |                                       |  |
| <u>     </u>   | Recor<br>leas va<br>lasic ojić<br>Factor<br>hace oji  | ding<br>Aus acqu<br>cle clock<br>cle clock   | stilion: [Isochronous recording<br>0.125 ms [Drive_un<br>[ | 1- tme-limited trace  |                                       |  |
| <u></u><br>  N<br>  8<br>  -<br> <br>                    | Record<br>Asac val<br>Asic cyc<br>Factor<br>Itace cyc<br>Duration   | ding<br>Aus acqu<br>Cle clock<br>cle clock   | alion [Isochronous recording<br>0.125 ms [Drive_un<br>     | g - time-limited bace<br>4_11<br>1-3<br>0.125 mi<br>682.500-3 mi  |                                       |  |
| <br>   | Recon<br>fear val<br>lasic cyc<br>Factor<br>hace cyc<br>hace cyc<br>hace cyc<br>hace cyc<br>hace cyc<br>hace cyc<br>hace cyc            | ding<br>Aus acqu<br>de clock<br>cle clock  | ation [Isochronous recording<br>0.125 ms [Dmvs_un<br>      | g - time-limited bace<br>4_11<br>1_2<br>0.125 ms<br>682 500 2 ms  |                                       |  |
| 8<br>8<br>7<br>7<br>0<br>1<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8 | Recon<br>Asso val<br>Asso oyo<br>Factor<br>Nace oyo<br>Nutation<br>Trigge   | ding<br>Aut acqu<br>cle clock<br>cle clock   | isilion: [Isochronous recording<br>0.125 ms [Drive_un<br>  | g - tme-limited bace<br>4_11<br>1_2<br>0.125 me<br>682 500 1 me<br>682 500 1 me   | ی<br>(4) Maximum duration: 682,500 ms | <u>8 mark</u> 2 H  |
| 1 2001<br>N<br>8<br>7<br>7<br>7<br>7<br>7<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8           | Recon<br>feas: val<br>fasic oyo<br>Factor<br>factor<br>unation<br>Trigge<br>fype:<br>Par. no. /   | ding<br>Aus acqu<br>Cle clock<br>cle clock<br>r(<br>vasiable   | Isochronous recording                                      | g - trine-limited trace<br>4_11<br>1_2<br>0.125 me<br>682 500 1 me<br>682 500 1 me<br>682 500 1 me  |                                       | Bitmask.<br>2' Here  |
| B<br>B<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C                     | Record<br>feas: val<br>fasic cyc<br>Factor<br>frace cyc<br>hace cyc<br>hace cyc<br>hace cyc<br>fuger<br>fype:<br>Pac.no, /<br>Cyc.elocl | ding<br>Aus acqu<br>de clack<br>cle clack<br>cle clack<br>a<br>cle clack<br>a<br>cle clack<br>a<br>cle clack<br>a<br>cle clack<br>a<br>cle clack<br>a<br>cle clack | Isochronous recording<br>0.125 ms [Drive_un<br>            | g - time-limited bace<br>4_1]<br>1_2<br>0.125 ma<br>682 500-2 ma<br>682 500-2 ma<br>stiem<br>2. Tagger word for laults of<br>J  | Massinum duration     682,500 ms      | <u>18 mark.</u><br>2 <sup>°</sup> Hex<br>18 patter. <u>Br.</u> |

图 4. 设置离线 Trace

(4)曲线读取完毕后,若需要再次记录曲线,则需要再次单击▶,以重新激活 Trace 功能。