SCATS 6.9.4 operating instructions

A guide to SCATS commands and alarms

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Chapter 1: Introduction

SCATS has a graphical user interface called SCATS Access that allows monitoring, management and manual intervention (locks, trims, dwells, incident plans, route pre-emption etc.). SCATS Access is the preferred client when using SCATS. See the SCATS Access online help for further details.

SCATS also has a command line interface called SCATS Terminal. This allows similar monitoring facilities, but all input is via commands entered at the keyboard. SCATS Terminal is no longer being developed.

This manual contains a description of the SCATS commands. These commands can be used when using SCATS Terminal or when running SCATS Region as a console application. The majority of the commands (except those that display data) can be used in action lists.

Keyboard operation

Esc	Indicates the **Esc** key.
Enter	Indicates the **Enter** (or carriage return) key.
=	Equals sign produced by pressing either the equals (=) key or the spacebar.

SCATS command terminators

Some programs you may have seen use the **Enter** key to end input of all data. SCATS varies slightly from the norm and has three different keys to terminate commands:

- `!` The exclamation mark is used to end the entry of data. Either the **!** key or the **Enter** key may be used to enter the exclamation mark.
- `/` The slash is used to clear or remove data, e.g. `AL/` is used to clear all clearable alarms at a site.
- `?` The question mark lists data, e.g. `AL?` to list all alarms at all sites.

There is no need to press **Enter** after a `?` or `/`.

SCATS prompts

- `.` The full stop (or period) is the SCATS 'dot prompt' and shows when a terminal is in SCATS mode. This can be confirmed by pressing the **Enter** key to see if the SCATS command terminator (`!`) prints.
- `_.` If the SCATS prompt is preceded by an underscore character, the terminal is still in SCATS mode but was reading a command file from the `DSK` prompt when an error was detected on the file being read. SCATS commands can still be entered from the keyboard even though the SCATS file prompt (`_.`) is showing. This is to allow the command that caused the file read error to be corrected interactively and the file read to be continued.

  Use:

  `CO!`

  To continue reading the file. Prior to entering `CO!`, you may manually enter the correct command from the keyboard.

  `KL!`

  To abort (kill) the file read.

Monitoring

If using a VAX, you can connect directly to a site or you can go to a region without knowing a site number on that region. There are also other commands to list the region names or the sites on a region as well as a command to list street names given a number or numbers given street names.

`region``::`	Connect to the nominated region.
`number`	Monitor the specified site.

Street name search

If using a VAX, you can find the location of a site given its number or you can find its number given a location.

STR *n*	Display the location of the nominated site.
STR *s1*[,*s2*[,*s3*]]	Display the locations of all sites that have the specified street names. You must provide a minimum of one street name and a maximum of three street names, separated by commas.

Security

A user ID and password is needed if you want to alter the traffic operation or modify any data that is stored in a SCATS Region. You should always log off your user ID if you leave your workstation unattended to prevent unauthorised access to the system. Note that all logons, logoffs, data changes, trims and locks are logged showing the date, time, region name, terminal number and user ID.

Logging on

HEL*n*	Log on with the nominated SCATS user ID, e.g. `HEL23`. Enter your password when requested.

Changing a password

If you are logged on to a stand-alone region, you can change your own password. If you are logged on with access level 1, you can also change the password of another user. This does not work with a VAX or SCATS Central Manager. In this case, an attempt to change a password will result in `*ERROR-ILL*`.

The password must be from 1 to 8 printable ASCII characters. This may include special characters such as %$# etc. Before you can change your password, you will be asked for your old password.

PSW	Change your own password (you must already be logged on).
PSW*n*	Change the password for the nominated user ID.

Logging off

You should log off your user ID if you leave your terminal unattended. In special circumstances, a level 1 user can log a person off remotely or can even log off everyone on the system, e.g. for a software update.

BYE	Logs off.

Showing connected terminals

WH?	List active terminal connections.
WHO?	Ditto

Sending messages

You can send a text message to a specific user or to all users.

"*n**message*	Send a text message to workstation number *n*, e.g. `"3Hello`.
"T*message*	Send a text message to all workstations that are monitoring the same region.
"*** *message*	Send a text message to all workstations that are monitoring the same region.
"0*message*	Send a text message to the monitored region's event log.
"0!*message*	Send a text message to the monitored region's event log and fault log. This is now redundant, as the fault log is no longer used.
"#*message*	Send a text message to the SCATS Central Manager and the SCATS Central Manager then broadcasts this to all workstations.

Typing a file

TYP=*filename*	Type a file on your terminal, e.g. TYP=SYS.MAP.
LST=*filename*	Ditto

Commands that do not use !, / or ? as a terminator

'
''
"
ALM
BYE
DSK
HEL
M1
M2
PSW
STAT
TCC

Commands that are not converted to upper case

'
''
"
ALM
M1
M2
STAT
TCC

Notes

Chapter 2: SCATS operating modes

A site connected to a SCATS Region can operate under any of the following modes:

Masterlink

The controller receives phase change requests from a SCATS Region and sends constant status updates to the SCATS Region (detector actuations, phase demands, current phase, phase interval, pedestrian movement status etc.).

Flexilink

The controller maintains coordination with other sites using cableless linking and a clock. Flexilink plans and Flexilink schedules are stored in the controller. If the Flexilink data is invalid, the site falls back to isolated operation. See *Standard Flexilink operation* for further details.

Isolated

The controller operates in isolation and does not coordinate with any other sites. If the site is connected to a SCATS Region, it still sends status updates so that it can be monitored. See *Traffic signal operation* for further details.

Master-Isolated

This is the same as Masterlink except that the coordination point is ignored and the stretch phase does not have time added or subtracted to maintain coordination. Master-isolated operation can only be selected from a variation routine.

Fixed-time

A non-adaptive method of Masterlink operation whereby schedules select any combination of split plan, offset plan and cycle length to override the normal Masterlink adaptive mode.

Notes

Chapter 3: Region data

This chapter describes the commands that are used to view and/or change the properties of a SCATS Region.

Summary of region data commands

The following commands are used to view and/or change the properties of a SCATS Region that are stored in the region's **Sys.lx** file:

Command	Meaning
DAP	Detector alarm checking period
DATE	Special dates
DILK	Maximum number of links
DISA	Maximum number of strategic approaches
DISI	Maximum number of strategic inputs
DISL	Maximum number of sites
DISS	Maximum number of subsystems
DITC	Maximum number of schedule entries
DIVS	Maximum number of VAX detector counts
ID	Region version number
IFP	Increment failure checking period
KEY	User access level
MDM	Modem server
NAME	Region name
PHD	Phone number for dial-in
PHT	Dial-out time
RK	Region options
TIM	Region time

The following commands are used to view and/or change the properties of a SCATS Region that are *not* stored in the region's **Sys.lx** file:

Command	Meaning
LIC	Licence
LOWBPS	Low bits per second
XK	Extended region options

Detector alarm-checking period

The DAP command is used to view or change the detector alarm checking period used by the monitored region. The mnemonic is derived from 'Detector Alarm Period'.

DAP? — Show the detector alarm checking period.

DAP=[*hh*]**:**[*mm*]**-**[*hh*]**:**[*mm*]**!** — Change the detector alarm-checking period to the time range specified, where *hh* is the hour using 24-hour clock (00–24) and *mm* is the minute (00–59). If the hour is 24, then the minute must be `00`. Use the maximum range (00:00–24:00) to specify a full day. The start time must be less than or equal to the end time. The colons separating the

hours and minutes must be present, but the hours and/or minutes may be omitted. Missing hours and minutes default to zero. Leading zeros may be omitted. The dash separating the two times must be present. This requires access level 1.

Special dates

The DATE command is used to view or change the special dates used by schedule entries in the monitored region. There is a maximum of 40 special dates.

DATE*n***?**	Show the details of special date *n*, if any, where *n* is 1 to 40.
DATE*n***=***dd*-*mmm*-*yyyy*[,[*a*][**P**]]**!**	Set the date for special date *n*, where *dd* is the day of the month (00–31), *mmm* is the three-letter abbreviation of the month in ASCII (i.e. JAN = January, FEB = February etc.), *yyyy* is the year (if *yy* is less than 100, then 1900 is added, if *yyyy* is less than 1970, then 100 is added), *a* is an alternate Flexilink day-of-week code number (0–15), **P** indicates a permanent date.
DATE*n***=!**	Clear the details for special date *n*.

Maximum number of links

The DILK command is used to view or change the maximum number of links that are available in the monitored region. The mnemonic is derived from DImensioned LinKs.

DILK?	Show the maximum number of links.
DILK=*n***!**	Change the maximum number of links to *n*, where *n* is 1 to 500.

Maximum number of strategic approaches

The DISA command is used to view or change the maximum number of strategic approaches that are available in the monitored region. The mnemonic is derived from DImensioned Strategic Approaches.

DISA?	Show the maximum number of strategic approaches.
DISA=*n***!**	Change the maximum number of strategic approaches to *n*, where *n* is 1 to 900.

Maximum number of strategic inputs

The DISI command is used to view or change the maximum number of strategic inputs that are available in the monitored region. The mnemonic is derived from DImensioned Strategic Inputs.

DISI?	Show the maximum number of strategic inputs.
DISI=*n***!**	Change the maximum number of strategic inputs to *n*, where *n* is 1 to 900.

Maximum number of sites

The DISL command is used to view or change the maximum number of sites that are available in the monitored region. The mnemonic is derived from DImensioned SLots.

DISL?	Show the maximum number of sites.
DISL=*n***!**	Change the maximum number of sites to *n*, where *n* is 1 to 250.

Maximum number of subsystems

The DISS command is used to view or change the maximum number of subsystems that are available in the monitored region. The mnemonic is derived from DImensioned SubSystems.

DISS?	Show the maximum number of subsystems.
DISS=*n***!**	Change the maximum number of subsystems to *n*, where *n* is 1 to 250.

Maximum number of schedule entries

The DITC command is used to view or change the maximum number of schedule entries that are available in the monitored region. The mnemonic is derived from DImensioned Timed Commands.

DITC? Show the maximum number of schedule entries.

DITC=*n***!** Change the maximum number of schedule entries to *n*, where *n* is 1 to 255.

Maximum number of VAX detector counts

The DIVS command is obsolete. It used to be used to view or change the maximum number of VAX detector counts that are available in the monitored region, but it is no longer functional. The mnemonic is derived from DImensioned Volume Stores.

See the VOLS command for the current method of specifying detector counts.

Region version number

The ID command is used to show the version of the monitored region. The mnemonic is derived from IDentification.

ID? This shows the SCATS Region version using the format:

SCATS *a.b.c.d*

where:

a is the major version number
b is the minor version number
c is the revision number
d is the build number

A commercial release refers to the first three numbers only. The build number is for internal use. This identifies test versions, beta releases and bug fix versions. The build number is usually omitted from user documentation, unless it is particularly relevant.

Please quote the full version number (including the build number) as 'version *a*.*b*.*c*.*d*' if you ever need to contact the SCATS help desk or your SCATS distributor with a query or bug report.

Example

ID?

```
SCATS 6.9.4.11
```

This indicates that the major version is 6, minor version is 9, revision is 4 and build is 11.

Increment failure checking period

The IFP command is used to view or change the increment failure checking period in the monitored region. The mnemonic is derived from Increment Failure Period.

IFP? Show the increment failure checking period.

IFP=[*hh*]**:**[*mm*]**-**[*hh*]**:**[*mm*]**!** Change the increment failure checking period to the time range specified, where *hh* is the hour using 24-hour clock (00–24) and *mm* is the minute (00–59). If the hour is 24, then the minute must be 00. Use the maximum range (00:00–24:00) to specify a full day. The start time must be less than or equal to the end time. The colons separating the hours and minutes must be present, but the hours and/or minutes may be omitted. Missing hours and minutes default to zero. Leading zeros may be omitted. The dash separating the two times must be present.

User access level

The KEY command is used to view or change the access level for a user in the monitored region. The mnemonic is derived from ‘access KEY’.

A level 1 user can define an access level for any other user.

Note that the access level set here is unique to the current region. Separate access levels are defined for each region.

KEY?	Show the access level for the current user.
KEY*n***?**	Show the access level for user *n*, where *n* is 1 to 200.
KEY*n***=***m***!**	Change the region access level for user *n* to access level *m*, where *m* is 0 to 7.
KEY*n***=***m***,***a***.***b***!**	Change the region access level for user *n* to access level *m* (as above) and change the access level for zone *a* to access level *b*, where *a* is 1 to 64 and *b* is 0 to 7. The access levels for zones are specified as a comma separated list. You only need to specify the changes, not the whole list.

Example

KEY7?

```
7,1.6,2.5,4.2
```

where:

The first number is the region access level. This is optionally followed by a comma-separated list of zone access levels using the format *a*.*b*, where *a* is the zone number and *b* is the access level for that zone.

Notes

You should use SCATS Access to change access levels. You should *not* use SCATS commands to change access levels, as the changes are not forwarded to the SCATS Central Manager. If you do, then the access levels stored by the SCATS Central Manager and the SCATS Region will be out-of-sync. SCATS Access will use the access levels stored in the SCATS Central Manager. SCATS Terminal will use the access levels stored in the SCATS Region.

You can use SCATS commands as a temporary fix while the SCATS Central Manager is offline, but any changes will be overwritten when the SCATS Central Manager comes back online. Changes will also be overwritten if the SCATS Central Manager is online and the SCATS Region is restarted.

Modem server

The MDM command is used to view or change the configuration of a modem server in the monitored region. The mnemonic is derived from MoDeM.

The MDM command was added in SCATS Region version 6.5.1 to support modem servers.

Syntax

MDM*m***=***address*[,[*first*[-*last*]][,[*group*][,[*max*][,[*phone*]]]]]**!**

where:

m is the modem number (1–50)

address is the modem's IP address in dotted decimal format (this must be an IP address, not a host name)

first is the first port to use in an optional range of ports on the modem for dial-up use (from 1 to number of ports on modem)

last is the last port to use in an optional range of ports on the modem for dial-up use (from (*first* + 1) to number of ports on modem)

group is an optional dial-up group number (from 1 to 25)

max is an optional maximum number of ports available on the modem (this is hardware dependent, typically 8)

phone is an optional phone number if connected to a DIDO unit

The modem numbers do not have to be allocated in sequence.

If the modem has multiple ports, you can specify a particular port to use. Alternatively, you can specify a range of ports and the modem will use the first port within that range that is not currently in use.

If you have multiple modem servers, you can allocate them to a group. SCATS Region will then use any modem server in the group that is not currently in use.

The total number of ports on the modem is updated automatically by SCATS Region, so this can normally be omitted.

The phone number can have commas to indicate pauses as used when specifying phone numbers elsewhere.

Region name

The NAME command is used to view the name of the monitored region. The mnemonic is derived from region NAME. Use the SCATS Region Configuration application to define the region name.

NAME? This lists the region name.

Note: This may be abbreviated to NA? or NAM?.

Phone number for dial-in

The PHD command is used to view or change the phone number that the SCATS Region sends to dial-in sites so that those sites can dial in when an alarm goes on or off. The mnemonic is derived from PHone Dial-in.

If you have dial-in sites on your system (i.e. COM=DI!), you need to specify the phone number that the sites will use to ring the SCATS Region.

PHD?	This lists the dial-in phone number.
PHD=*phonenumber***!**	This sets the dial-in phone number passed to a COM=DI! site to allow it to inform SCATS Region of a change of alarm. You can use up to 23 digits. Use a comma for a delay.

Dial-out time

The PHT command is used to view or change the time that the monitored region starts dialling out to dial-up sites to request them to return their current status. The mnemonic is derived from PHone Time.

The dial-out time is the time that the SCATS Region starts ringing each dial-in or dial-out site to request the site status. The SCATS Region will ring a site up to 4 times before giving up and sending a dial-up failed message to the SCATS event log.

Note that the dial-out time only has provision to ring once per day. If you want to ring more than once per day, schedule the times using action lists and schedule entries.

PHT?	This lists the dial-out time.
PHT=*hh***:***mm***!**	This sets the dial-out time, where *hh* is the hour using a 24-hour clock (00–23) and *mm* is the minute (00–59).
PHT=!	This clears the dial-out time.

Region options

The RK command is used to view or change the region options in the monitored region. The mnemonic is derived from Region Keys.

RK?	This lists the region options for the monitored region.
RK=!	This clears all the region options for the monitored region.
RK=CC!	CC = Command Confirmation. This enables command confirmation on data changes that would not normally require command confirmation. This includes: ■ changing site configuration ■ changing lamp state

- applying and removing locks and trims
- applying and removing dwells

When using a command line interface, `Confirm (y/n)?` is displayed. In this case, enter `Y!` for 'Yes' or `N!` for 'No'. The default is 'No'.

When using a command line interface to change lamp state for more than one site, confirmation is always required. For example, `SS=3!LS=ON!` will always request confirmation.

RK=CD! CD = Clock alarms Disabled. This prevents clock alarms from being generated. This is useful in areas where clock drift is severe enough to cause frequent alarms.

RK=CL! CL = Command Logging. This enables logging of user commands on the SCATS Region event log printer. If the SCATS Region is not configured to use an event log printer, then the user commands are logged on the SCATS Central Manager event log printer. If the SCATS Central Manager has no event log printers, leave this option clear.

RK=DG! DG = Disable deGree of saturation modification. This disables the degree of saturation modification. The degree of saturation is normally modified by a factor to compensate for inaccurate sampling at short phase times. If this option is set, the degree of saturation is not modified. This option is now deprecated. It is recommended that you do not use it, as it will be removed in a future release.

RK=DM! DM = Detector Maximum. Maximum flow data is normally updated every weekday (Monday to Friday). If this option is set, maximum flow data is updated every day, including weekends. Use this option if Saturday and Sunday traffic in your area is just as busy as the other days.

RK=DS! DS = Disable new degree of Saturation algorithm. This disables the new degree of saturation algorithm that was introduced in the early 1990s. This option is now deprecated. It is recommended that you do not use it, as it will be removed in a future release.

RK=DU! DU = Daily update. This enables the uploading of RAM data from the SCATS Region to the controller for all non-dial-up sites at 01:10 each day.

RK=DX! DX = Disable XU alarms. This disables the generation of external unit (XU) alarms from sites where the controller is less than VC4.

RK=EI! EI = Enable Input mapping. This enables the editing of detector input mapping for sites with VC5 or higher controllers.

Note: Each site also has an option to enable input mapping on that site only, i.e. `IK=EI!`

RK=FL! FL = File logging. This logs commands read from a file via action lists, the **Load data file** menu item in SCATS Access and the `DSK` command entered from a command line interface.

RK=FM! FM = Faults are Major. If this option is set and a strategic approach using data from the critical site of a subsystem produces a degree of saturation of zero during the data collection phases for three consecutive cycles during the increment failure checking period, then SCATS Region generates a major alarm and writes an event to the event log using the format `SS=23 SA=145 DS FAULT (no DS for 3 cycles)`. Note that at low traffic times it may be normal for some strategic approaches to produce a zero degree of saturation for three consecutive cycles, so this option is normally cleared.

RK=FN! FN = Forced No skip. When set, a dwell applied at priority 1 to 8 will not skip any demanded phases from the active phase to the dwell phase. This is typically used to prevent the situation that can occur when green window requests from an ITS application continually apply dwells for a particular phase and other phases do not get a chance to run. This option has no effect if a dwell is applied by a variation routine (priority 9) or a user (priority 10). See also `IK=FN!`

RK=FT! FT = Fixed-time operation. This sets extra special facility (XSF) flag 4 for all sites using a VC4 or later controller in a subsystem that has an active fixed-time plan with no locks or trims. This was originally implemented for Hong Kong so that sites with no detectors could automatically demand and extend phases. The site's personality must be able to detect that XSF flag 4 is on and automatically demand all phases, similar to a software arterial. (Note that SCATS XSF flag 4 is equivalent to XSF bit 3 in the controller.)

RK=FU! FU = Full Update. When a RAM update is performed:

- If this option is set for VC4 or later controllers, SCATS Region reads all the time settings, Flexilink plans, Flexilink schedules and detector categories from the controller. If any of these values are different to the SCATS Region's master copy, it sends the different values to the controller to be updated in RAM.
- If this option is not set or the controller is less than VC4, SCATS Region sends only those time settings that are different in RAM and have not previously been sent. It then sends all Flexilink plans and Flexilink schedules. It does not send detector categories.

RK=FY! FY = Flashing Yellow. This logs flashing yellow alarms as blackout alarms. This feature is included for those countries that do not have controllers that display flashing yellow.

RK=IC! IC = Include Cycle length. SCATS Region normally calculates congestion using traffic flow and degree of saturation. However, this may not be a true representation of congestion in situations where SCATS Region cannot adjust the cycle length and phase splits to reduce the degree of saturation. If this option is set, cycle length is included in the congestion calculations. Note that if this option is selected, no congestion can be determined for sites running in isolated or Flexilink modes.

RK=IR! IR = Invalid RAM. If SCATS initiates a RAM update by sending a 'clear RAM' message, the controller generates an invalid RAM (IR) alarm, which then starts the RAM upload. The invalid RAM alarm thus generated is not really an alarm. If this option is not set, the invalid RAM alarm is not generated during a RAM update. However, if the RAM is indeed faulty, an invalid RAM alarm will be generated on completion of the update.

RK=MM! MM = Maintenance Mode. This enables the features associated with maintenance mode. For example, when a site is in maintenance mode, all its site alarms are hidden from SCATS status displays, but can be seen when monitoring the site. RAM update is requested when maintenance mode is cleared.

RK=NB! NB = No Blackout. When a checksum alarm occurs, a site normally blacks out or goes to flashing yellow. If this option is set, the site does not black out or go to flashing yellow after the checksum alarm occurs.

RU=NQ! NQ = No Queue. This disables the queuing of plan locks.

RK=NU! NU = No Update. This prevents SCATS Region from uploading new RAM data to the site. This is intended to prevent overwriting RAM data when a site is first connected, when a site has been offline for an extended period of time or when a personality has been changed. This allows any local time settings to be manually downloaded from the controller and saved to the SCATS Region. This option affects all sites in the region. For a single site, see `IK=NU!`

RK=NW! NW = No Watchdog reset. This prevents the automatic reset of a controller watchdog, which generally results in a successful restart. This also disables the manual reset that could normally be done by clearing the watchdog alarm or using the `RSW!` command from a command line interface. In this case, the restart must be done on site. If this option is not set, SCATS Region will attempt one watchdog reset when a site reports a watchdog alarm.

RK=SA! SA = Single Approach. Under normal circumstances, the increment failure counter is incremented if the average degree of saturation for all voting strategic approaches is zero over three consecutive cycles during the increment failure checking period. If this option is set, the test applies to a single strategic approach rather than all voting strategic approaches.

RK=SN! SN = Skip 'NIS=NXP' test. If the walk intervals of a pedestrian movement are allowed to overlap into the next phase in sequence but that phase has not been demanded, the walk 2 interval is normally allowed to extend as long as possible in case the phase is demanded. If this option is set, the walk 2 interval is not allowed to extend in these circumstances, but is terminated as soon as the SCATS nominated walk time has expired.

RK=TI! TI = Test sites Ignored. If this option is set, alarm state changes for test sites are recorded in the SCATS Region event log. If not set, alarm state changes for test sites are not recorded.

Note: The number range that defines test sites is configured by a system administrator using SCATS Region Configuration.

RK=TL! TI = Timed Locks. This enables timed locks for legacy systems with a VAX and no SCATS Central Manager. For all other systems with a SCATS Central Manager, timed locks are always enabled.

RK=VI! VI = Validate Intersection. When a site initially connects (or reconnects after a communications failure), SCATS Region checks the checksum and VC number. If either is incorrect, a validation error (VE) alarm is generated. If this option is set, the SCATS Region additionally checks the site number in EPROM with the SCATS site number. This is applicable to VC3 or later controllers.

Modifying region options

Region options can be set or cleared without affecting any other options by preceding the option(s) with a plus sign (to set) or minus sign (to clear). For example:

RK=+CDCC! Sets the CD and CC region options without changing any other options.

RK=-NB! Clears the NB region option without changing any other options.

Region time

The TIM command is used to view or change the time in the monitored region. The mnemonic is derived from TIMe.

TIM? This lists the current region time.

TIM=[*dd*-*mmm*-*yyyy*] [*hh*:*mm*[:*ss*]]! This sets the region time, where *dd* is the day of the month (00–31), *mmm* is the three-letter abbreviation of the month in ASCII (i.e. JAN = January, FEB = February etc.), *yyyy* is the year (if *yy* is less than 100, then 1900 is added, if *yyyy* is less than 1970, then 100 is added). *hh* is the hour using a 24-hour clock (00–23), *mm* is the minute (00–59) and *ss* is the second. The date and the time can be entered in either order. If the date is omitted, it is left unchanged. If the time is omitted, it is left unchanged. If the seconds are omitted, they are set to 00.

Licence

SCATS Region uses a licence that restricts access to some functionality and limits the number of sites, workstation connections and intelligent transport systems (ITS) connections that can be used simultaneously. Each licence has a licence name and licence details that are stored in the Windows® registry using SCATS Region Configuration. This program is also used to select options or specify settings unique to each SCATS Region.

LIC! Show the licence details for the monitored region.

LIC? Same as above.

Example

LIC?

```
Registered user: Roads and Maritime Services
Maximum sites:  250
Maximum workstations:    30
Maximum ITS connections:  100
Options:
  Adaptive operation
  VAX Central Monitoring
  Dialup Intersections
  ANTTS
```

Low bits per second

From SCATS version 6.9.4, there is a LOWBPS command to force communications at 300 bits per second for the whole region. This is intended for countries that use controllers fitted with low speed modems.

LOWBPS! The entire region is forced to run at a communications rate of 300 bits per second. This should only be used when all controllers in the region have slow modems that do not use HDLC.

LOWBPS Only sites with serial communications will run at 300 bits per second.

Extended region options

Note: Extended region options are *not* saved in the region's **Sys.Ix** file, whereas region options *are* saved in the region's **Sys.Ix** file. If SCATS Region is stopped, these options will not be restored when SCATS Region is restated.

If manually entered in the region's **Sys.Ix** file, they are all cleared after the **Sys.Ix** file has been loaded. This is because some of them are acted upon during initialisation and it doesn't make sense to act on them twice, e.g. convert slots to sites.

XK=CE! CE = Communications Error. This displays all CE alarms.

XK=CP! CP = Communications Ports. If importing a SCATS Region version 5 **Sys.Ix** file, edit the file and insert `XK=+CP!` as the first record to automatically allocate serial ports sequentially from slot 1.

XK=HK! HK = Hong Kong. This prevents adding one to volume original (VO) calculations.

XK=LD! LD = Log Debug. This causes extra debug messages to be logged.

XK=SL! SL = SLot pointers. If importing a SCATS Region **Sys.Ix** file that contains slot pointers instead of site numbers, edit the file and insert `XK=+SL!` as the first record to automatically convert slot pointers to site numbers.

XK=TS! TS = Traffic simulation. This runs a simple traffic simulator that produces phase demands, signal group greens, detector actuations, detector occupancy for strategic monitor displays, and phase intervals. This allows SCATS Region to be demonstrated without needing a controller. Sites can be monitored, blacked out etc. Graphics data operates as for normal sites. This option disables normal SCATS Region operation.

XK=XP! XP = XSF Phase demands. This allows phase demands to be controlled by XSF flags as follows:

- XSF flags 1 to 7 demand A to G phases respectively
- XSF flag 8 causes a request for termination (RFT)
- XSF flags 11 to 18 demand pedestrian movements 1 to 8 respectively

Notes

Chapter 4: Site data

Site pointer

Before you use any command to get, set or clear site-related data, you must first specify the site that the command will apply to. This is done by setting a 'site pointer'. The site pointer may be set using the SLOT command or the I command. The SLOT command sets the slot number and the site pointer is determined from the site allocated to that slot. The I command sets the site pointer directly. In this case, the site must be in the monitored region.

If you do not set the site pointer, the default site pointer varies depending on the application that you're using to run SCATS commands. If using SCATS Terminal, the slot is initially set to 1 and the site pointer is set to the site that is allocated to slot 1. If running SCATS Region as a console application or running an action list, the slot and site are both initially set to 0, so the site pointer is undefined.

Listing site data

The following commands relate to accessing and listing data for a site. Site data can also be accessed by its slot, the physical location of the data.

***n*!**	Set site pointer to site *n*.
I?	List site pointer.
***n*!L!**	Set site pointer to site *n* and list data.
***n*,L!**	List site *n* data without changing the site pointer.
I=*!L!	List all sites – set pointer to the last site.
I=*,L!	List all sites without changing site pointer.
***n*!EN!**	Invoke auto prompt mode for data entry of all items for site *n*.
SL=*n*!	Set slot pointer to slot *n*.
SL?	List slot pointer.
SL=*n*!L!	Set slot pointer to slot *n* and list data.
SL=*n*,L!	List slot *n* data without changing the slot (site) pointer.
SL=*!L!	List all slots – set pointer to the last slot.
SL=*,L!	List all slots without changing the slot pointer.
SL=*n*!EN!	Invoke auto prompt mode for entry of all items in slot *n*.
SL*n*?	List number of phases and split plans at slot *n*.
SLV?	List vacant slot numbers (i.e. slots with INT=0!).

Example

L!

```
SLOT12=2,1,2!INT=123!VC=5!CS=20,$10!PK=/
COM=14!BPS=300!CTYPE=C12V5R78S13!
IK=!
S#=25!LM=MF!RMN=0!DCL=0!VP#=10!
VOLS=1-24!
AT=6!BT=6!
W1=8!W1T=12!W2=8!W2T=13!
PP1=0,0B!PP2=0,0B!
PP3=0,0B!PP4=0,0B!
```

Each of the items in the slot can be listed by typing its name, followed by a question mark, e.g. S#?RMN?LM?

Individual items may be entered or amended by first setting the required site (or slot) pointer then entering the item followed by its value, e.g. `123!AT=5!`

For confirmation of a data change, the site will be echoed after each change.

All commands that change data will be logged, along with the user ID, date, time and terminal number.

Changing data

Changing a site

`INT=0!` To change a site, zero the number first, then enter the new site, e.g. `INT=0!INT=123!`

Changing the number of phases

`SLOT`*n*`=`***x*`!`** To change the number of phases, enter `SLOT`*n*`=`*x*`!` where:

n is the slot number (1 to `DISL`)
x is the number of phases (2 to 7)

Update the split plan data if you change the number of phases at a running site.

Changing the number of plans

`SLOT`*n*`=,`*y*`!`** To change the number of split plans, enter `SLOT`*n*`=,`*y*`!` where:

y is the number of plans (1, 4, 8 or 16)

Changing the number of walks

`SLOT`*n*`=,,`*z*`!`** To change the number of walks, enter `SLOT`*n*`=,,`*z*`!` where:

z is the number of walks (0 to 8)

Changing combinations of phases, plans, walks

Any combination may be specified – fields not specified remain unchanged, e.g.

`SLOT`*n*`=`*x*`,`*y*`!`** Changes the number of phases and plans.

`SLOT`*n*`=`*x*`,,`*z*`!`** Changes the number of phases and walks.

`SLOT`*n*`=,`*y*`,`*z*`!`** Changes the number of plans and walks.

`SLOT`*n*`=`*x*`,`*y*`,`*z*`!`** Changes the number of phases, plans and walks.

Default slot values

When a new slot is dimensioned, it defaults to 2 phases, 1 plan and 0 walks.

Explanation of site data listing

***n*`!L!`** Displays slot data for site *n*.

`SL=`*n*`!L!`** Ditto

```
SLOTm=x,y,z!
```

where:

m is the slot location number of the data storage array

x is number of phases, from 2 to 7

y is number of plans. 1, 4, 8 or 16 for degree of saturation voting subsystems (i.e. VO subsystem option is clear) or 1 or 4 for volume voting subsystems (i.e. VO subsystem option is set)

z is number of walks (0 to 8)

`INT=`*n*`!`** Site number.

Hint: Use `INT=0!` as an intermediate step when changing an existing site number.

Monitoring a site

Enter *n*`!` (where *n* is a site) from the SCATS 'dot' prompt to monitor that site.

Monitoring a dial-up site

If the site is a dial-up site (i.e. has `COM=DI!` or `COM=DO!` in the slot data), after entering *n*`!` to connect to the site, use:

`CON!` To initiate the dial-up connection.

`CON/` To hang up the dial-up connection.

`CON=`*n*`/` To hang up a non-monitored site currently in dial-up mode. Use `WHO?` to see if anyone is connected to a dial-up site.

`CON?` To list all dial-up sites being monitored. This can return the following states:

- `T` connection initiated from a terminal (operator workstation)
- `F` connection initiated from a field terminal
- `D` connection initiated by a dial-in request from a site
- `*` connection is active

`DDO!` Delay the SCATS Region's automatic dial out to sites for 30 minutes to allow a user to access a dial-up site.

`DDO?` Display the dial-up delay timer.

`DDO/` Clear the dial-up delay timer.

This is not necessary for a permanent dial-up site.

Controller/SCATS Region compatibility mode

`VC=`*n*`!` *n* defines the controller mode – the mode must be compatible with the controller software otherwise the controller may not recognise a new feature that may cause an ST alarm. Modes are upwardly compatible.

`VC=0!` Standard mode – no special features.

`VC=1!` Allows specification of Q+ signal in Flexilink.

`VC=2!` Allows transmission of lamp fault (LF) and lamp wattage (LW) commands to the controller.

`VC=3!` Allows transmission of lamp dimming (LD) and XID commands to the controller. Allows calendar date update. The following controller software is VC3 compatible:

- Delta3 C7V2R2
- PTF3 C9V2R2
- PSC2 C12V2R11
- otherwise, set `VC=2!`, but not in USA.

`VC=4!` Supports:

- 24 vehicle detectors
- 8 pedestrian features
- detector alarm categories
- HDLC communications (but only for some releases from some manufacturers)
- XSF signals in Flexilink data
- limit green watchdog (GW) timing
- extra byte in SSF, NXP, SST, BVO messages

- police off, police red, police manual, hurry call and maintenance interrupt modes
- special facility alarms (SSF 1–3)

VC=5! Supports:

- 24 signal groups
- electronic equipment ID
- detector input mapping

Checksum

CS=*n*! Checksum *n* is the sum of all numbers stored in the read-only memory (ROM) at the controller.

The **Sys.Ix** file only displays the octal checksum value. If displaying the checksum value on a terminal using the `L!` or `CS?` command, the value is displayed in octal and hexadecimal, with the hexadecimal value being preceded by a dollar sign.

If the checksum value differs from the controller-determined checksum, SCATS Region will generate a checksum (CK) alarm. If the region options do not include NB (no blackout on checksum error), the lamp release signal will be sent, resulting in either a blackout (BO) or flashing yellow (FY) alarm.

If a checksum is manually entered (i.e. not from file) that differs to the current checksum, an automatic RAM update is invoked to reload the site RAM to ensure that data from the time settings EPROM is copied into RAM.

Evaluating checksum

SU=*n*? Evaluate checksum of EPROM number *n* in the controller.

SU=*? Evaluate total checksum of all EPROMs in the controller.

SCATS Region displays the checksum value in octal and hexadecimal. Enter either of these two values for the checksum in the site data, but if entering the hexadecimal value, precede it with a dollar sign.

Example

```
CS=$F7!
```

Checksum pages for personalities and time settings

Type	Personality	Time settings
Delta	SU=50,51	SU=54
Delta (with conversion card)	SU=31,32...37	SU=30
PTF	SU=30,31	SU=32
PTF3	SU=31,32...37	SU=30
Delta 3	SU=41,42...47	SU=40
PSF (all types)	SU=20,21...23	SU=26

Note: A checksum error indicates a fault. The master checksum should only be altered by qualified personnel.

Contact the controller manufacturer for other controller types such as PSC, Eclipse, QTC, ATSC4 etc.

Parking alarms

To aid in determining what alarm conditions exist at all sites on a regional computer, several commands are available to display a summary of alarms. If you want to exclude a site from the alarm summary, you can park the alarms. However, when you monitor a site, all alarms that belong to the site will be displayed on its alarm line regardless of the parked alarm state.

PK=! Parks alarms at the site, i.e. excludes alarms from the alarm summaries and logs the active

status.

PK=/ Unparks alarms at the site, i.e. includes alarms in the alarm summaries. This also unsuspends the site if it was suspended.

PK/ Same as above.

PK=S! Suspends a site and parks alarms.

PK=S/ Unsuspends a site, but does not change the parked status.

Allocation of site to zone

A site can be allocated to a zone for access control purposes. When a user tries to perform a site-related command, the access level used to determine whether this is permissible is the higher of the region access level and the zone access level allocated to that user.

ZSL=*n*! Allocates the site to zone *n*, where *n* = 1 to 64.

ZSL=0! Removes the site from a zone.

ZSL=! Same as above.

ZSL? Shows the zone that the site is allocated to.

Communications

Communications type

COM=*n***!**	Allocates a physical serial port to a site for communicating with the outside world. This is a value in the range 0 to 256. `COM=0!` disables communications.
COM=*n***,H!**	`H` indicates HDLC.
COM=DI!	The site is fitted with a dial-in device (such as a DIDO unit) which can contact SCATS Region when a fault is detected. Operator monitoring is achieved by using the `CON!` and `CON/` commands to dial out to the site.
COM=DI,P!	`P` indicates permanent dial-up connection. Can also have `P,H`.
COM=DO!	The site is fitted with a modem that allows an operator to dial out to the site on demand with `CON!`. The site cannot dial in to SCATS Region.
COM=NET!	Networked terminals – communicate with a communications server on the LAN.
COM=NET,H!	`H` indicates HDLC.
COM*n***?**	List the user of physical serial port *n*, i.e. site, terminal etc.
COM=*m***:***n***!**	Modem server *m*, port *n*.
COM=*m***:***n***,H!**	As above, but uses HDLC.
COM=*m***:***n***,S[,H]!**	`S` indicates serial port.
COM=DI[,P],*m***:0!**	`0` indicates any port.
COM=DI[,P],*m***:***n1***[-***n2***]!**	Port range *n1* to *n2*.
COM=DO[,P],*m***:***n1***[-***n2***][,H]!**	`H` indicates HDLC.
DI?	List all the sites with `COM=DI!`
DO?	List all the sites with `COM=DO!`
NET?	List all the sites with `COM=NET!`

Baud

For all sites except dial-in sites (`COM=DI!`), you need to specify the transmission speed in bits per second. This goes in the `BPS` entry in the slot data.

`BPS=`*`n`*`!` Specify the communications speed in bits per second. Dial-in sites have no BPS setting as they default to 2400.

Dial-up sites

Dial-up sites require a telephone number to allow SCATS Region to dial out to that site from a predetermined time each day. Dial-up sites cannot run Masterlink mode unless dwelled.

`PH=`*`number`*`!` Up to 23 characters can be specified. Use a comma between numbers to insert a delay.

Dial-out days

You can nominate which days of the week that SCATS Region will automatically dial out to a site with `COM=DI!` or `COM=DO!` to establish its state.

`DD=`*`list`*`!` Specify the days of the week. Sunday is day 1, Saturday is day 7. Use a comma to separate the day numbers. Use a dash between a range of numbers, e.g. `DD=1-7!`

Physical port usage

The `PORTS?` command shows what physical communications ports have been configured for your system.

Example

`PORTS?`

```
SUMMARY OF PORTS
Permanent site ports: COM17 to COM32 (16)
Unused: COM20,23-24,30-32 (6)
Dialup intersection ports   : COM14-16
Networked intersections     : TCP/IP port 2004

VAX port: NOT DEFINED
CM port: TCP/IP (port 2007) - [ACTIVE]
ITS port: TCP/IP (port 2005) - [0 ACTIVE]
MAP port: NOT DEFINED

Serial Terminal ports: (4)
  COM4 - 9600 bps
  COM5 - 9600 bps
  COM6 - 9600 bps
  COM7 - 9600 bps - [MODEM]
Scatterm TCP/IP port: 2000
GUI TCP/IP port: 2001
```

Virtual port usage

The `PORT`*`n`*`?` command shows the user of virtual port *n*. For example, if SCATS Region has serial ports 3 to 130 allocated for the use of sites, then `PORT1?` shows the user of virtual port 1 as physical port COM3.

Example

`PORT1?`

```
COM3: Slot 1 - Int 123 - 300 bps
```

Saving controller communications messages and statistics

From SCATS Region version 6.9.2, hourly statistics are collected for the following controller communications properties:

- Number of ping requests.
- Number of overdue messages.
- Number of communications errors and their reasons.
- Number of sent and received messages.

These statistics are discarded at the end of each hour unless you use a command to save them to the SCATS Region's event log.

From SCATS Region version 6.9.2, whenever you view controller communications messages in SCATS Access, the messages are saved in a binary file in the SCATS Region's **ScatsData\Dump\Comms** folder.

From SCATS Region version 6.9.2, the following commands can be used to manage the above controller communications messages and statistics:

I=*n***!COMS=***m***!**	Start saving data for site *n*, where *m* is the type of data as follows: ■ If *m* = 0, don't save any data. ■ If m = 1, save hourly communications statistics in the SCATS Region's event log, specifically: ● Number of ping requests. ● Number of overdue messages. ● Number of communications errors and their reasons. ● Number of sent and received messages. ■ If *m* = 2, save the raw controller communications (Rx/Tx) messages in a binary file in the SCATS Region's **ScatsData\Dump\Comms** folder. The same thing is done when viewing the messages in SCATS Access.
COMS*n***=***m***!**	Same as above, but don't change the site pointer.
I=*!COMS=*m***!**	Start saving data for all sites.
I=*n***!COMS[=]/**	Stop saving data for site *n*.
COMS*n***[=]/**	Same as above, but don't change the site pointer.
I=*!COMS[=]/	Stop saving data for all sites.
I=*n***!COMS?**	Show data that is currently stored for site *n*.
COMS*n***?**	Same as above, but don't change the site pointer.

Site options

Site options were introduced in SCATS Region 6.5.1. These act in a similar way to region options, except that they affect sites. The mnemonic `IK` is derived from Intersection Key.

IK=*options***!**	Set site options, where *options* is a list of one or more of the options listed below.
IK=DE!	Detector estimation. This enables detector estimation.
IK=EI!	Enable editing of detector input mapping data for all sites of VC5 or higher. See also `RK=EI!`
IK=ES!	ES is derived from Extended Support. This is only applicable to VC5.1 controllers. If the site does not use a VC5.1 controller or the ES option is cleared, the extended features of VC5.1 controllers are disabled. If the site uses a VC5.1 controller and the ES option is selected, the extended features of VC5.1 controllers are enabled. This includes the reporting of signal group colours, the distinction between the clearance 1 and clearance 2 pedestrian intervals (rather than just clearance) and the ability to place artificial detector actuations.

IK=FN! Forced no skip. When set, a dwell applied at priority 1 to 8 will not skip any demanded phases from the active phase to the dwell phase. This is typically used to prevent the situation that can occur when green window requests from an ITS application continually apply dwells for a particular phase and other phases do not get a chance to run. This option has no effect if a dwell is applied by a variation routine (priority 9) or a user (priority 10). See also RK=FN!

IK=FU! Full RAM updates. This enables full RAM updates.

IK=LD! Enable logging of extra debug messages.

IK=NU! Prevents SCATS Region from uploading new RAM data to the site. This is intended to prevent overwriting RAM data when a site is first connected, when a site has been offline for an extended period of time or when a personality has been changed. See also RK=NU!

IK=RC! This allows updating of the controller clock when a site is on fallback.

IK=RM! Indicates the controller is a ramp-metering site or other non-traffic signal site.

IK=RP! Request all pedestrian status. This is permanently disabled. Please ignore it.

IK=SI! Enables the calculation of degree of saturation from the strategic inputs when the site is blacked out or flashing yellow, even though traffic is not controlled.

IK=SO! Stretch option. Use the new method for adjusting the length of the stretch phase when the calculated length is less than the minimum. Available from version 6.6.3.0.

Subsystem

Groups sites into subsystems for the purpose of coordination.

S#=*n*! n is the subsystem number to which the site is allocated.

S#=0! Is valid for isolated or Flexilink mode but not for Masterlink mode.

Link mode

The link mode determines the normal operating mode of the site. If the normal operating mode is Masterlink, then the link mode also determines the fallback mode of operation. Dial-up sites cannot run Masterlink unless they are permanently connected.

LM=I! Isolated operation (default).

LM=F! Flexilink operation with fallback to isolated operation. The site will fall back if the Flexilink data does not exist, is bad or is corrupted. Corrupted Flexilink data may cause an invalid RAM (IR) alarm.

LM=MI! Masterlink operation with fallback to isolated operation.

LM=MF! Masterlink operation with fallback to Flexilink operation.

Changing link mode at multiple sites

To change the link mode of all sites in a subsystem precede the LM command with the desired subsystem, e.g.

SS=4!LM=F^! Changes the link mode at all sites in subsystem 4.

Link mode and subsystem fallback

A site with LM=MI^! or LM=MF^! will notify its subsystem when a power failure (PF), stopped talking (ST) or forced fallback (FL) alarm occurs. The subsystem will then either start its fallback pending timer or its fallback active timer.

- See sections ‘Fallback due to alarms’ and MR! command on resetting the site clock time for more information.
- See section on ‘Temporary link mode’.

Controlling low demand operation

RMN=*n***!** RMN controls the low demand operation. Below a cycle length of *n* seconds, with no demands at the end of the stretch phase, the stretch phase will go into extra time for a period equal to the sum of the minor phase lengths. *n* can only be an even number. Odd values will be rounded up.

On receipt of a demand for another phase, the extra time phase is immediately terminated provided there is enough time to run the late demanded phase (active phase clearance + 10 seconds).

If no demands are received before this period expires, the stretch phase will reset. The site must be running Masterlink for this routine to operate.

RMN=0! XT operation is enabled at all cycle lengths.

Split plan cycle-related control

DCL=*n***!** *n* is a cycle length for the control of double cycling operation, as well as the AS and FS phase features.

Variation parameter entries

VP#=*n***!** Specifies the number of variation parameter entries for this site.

See variation parameters for more information.

Collection of detector counts

Detector counts for all detectors at all sites may be collected permanently. The site data contains the entry VOLS that contains the detector specification.

VOLS=*list***!** Enter the detector numbers for detector volume collection. Use a dash to separate a range or use a comma between numbers, e.g. `VOLS=1-16!` collects data for detectors 1 to 16 inclusive.

Data is saved on daily files in the SCATS Region's **ScatsData\Vs** folder. Each day's file uses the file naming convention ***region_yyyymmdd*.vs**, where ***region*** is the region name and ***yyyymmdd*** is the date, e.g. **CITY_20090324.vs** is for the CITY region on 24 March 2009.

If the FV region option is set, 5-minute volumes are collected, otherwise 15-minute volumes are collected.

Phase clearance (intergreen)

The clearance time for a phase is the time taken by the controller from the termination of the green display of the running phase up to the introduction of the green in the next phase. This is timed and controlled entirely by the site.

A copy of this time needs to be stored in the slot data for each phase. SCATS Region uses this value to send a phase termination signal at the correct time so that the phase runs for the optimal length. It is also used to ensure that the site timing is working correctly (i.e. the site is not stuck in a phase).

When SCATS Region instructs a phase to terminate, it times off this time in parallel with the site. If the site takes too short or too long a time compared with the values in the slot data, SCATS Region may produce a short clearance (SC) or long clearance (LC) alarm.

AT=*n***!** Phase clearance for A phase – time between the call to and the start of the next phase and is the sum of early cut-off green, yellow and all-red intervals for that phase. Similarly, `BT` for B phase, `CT` for C phase etc.

TSC*? Use to obtain the values used by the controller (or `TSCA*?` for A phase `TSCB*?` for B phase etc.).

If the intergreen time used by the controller is four or more seconds shorter than the intergreen time specified in the site data, a short clearance (SC) alarm will occur.

If the intergreen time used by the controller is longer than the time specified in the site data, a long clearance (LC) alarm will occur if the phase intergreen holds up the expected return of the green time from the next phase by more than six seconds.

If the green from the next phase is not received within sixteen seconds of the expected time, SCATS Region will send the site to its fallback mode, and display a forced fallback (FL) alarm.

Z5 facility

If the phase clearance time is followed by the letter 'S' (e.g. `AT=5S!`), when that phase runs, SCATS Region will send a Z5 signal six seconds before the call to the next phase.

If the site personality is programmed to stop the introduction of a special movement when a Z5 signal is present, inhibit (IH) alarms associated with special movement timers can be prevented. See the IH alarm in Site alarms section for details on tracing IH alarms.

The Z5 will have no affect if a special movement is introduced before the Z5 is sent.

Special movement timers should not exceed 5 seconds, to cover the possibility of the special movement being introduced just as the Z5 is sent. A 5-second timer will always expire before the maximum is due.

The inclusion of an 'S' on `AT`, `BT` etc. will not affect a site that is not programmed to respond to a Z5 signal.

Pedestrian movement walk duration

`W1=`*`n`***`!`** Subject to walk clearance and phase overlap specifications, the walk is to be terminated *n* seconds after the start of the phase. (`W1` for walk number 1, `W2` for walk number 2 etc.)

Positive-value walk

If *n* is longer than the minimum time for the walk in the controller (i.e. the greater of the times in EPROM or RAM), SCATS Region will attempt to run the walk for this longer time, provided that the phase length can accommodate the longer walk. If the phase length is not long enough, SCATS Region will reduce the walk time accordingly.

Negative-value walk

If *n* is negative, the walk will be terminated *n* seconds before the maximum time for the phase. At slave sites, a negative walk can be used on the stretch phase (slave phase) only if the pedestrian clearance is less than the slave offset.

Zero-length walk

If *n* is zero, the walk will be terminated at 'minus clearance' from the end of the phase. (The clearance time for walk 1 is entered in `W1T` in the site data, walk 2 in `W2T` etc.).

For VC=0, 1, 2 and 3 controllers, SCATS Region is informed that a walk is ready for termination after the walk minimum has expired. VC4 or higher controllers inform SCATS Region when the walk is running, which can allow SCATS Region to send a walk termination signal before the walk minimum has expired. However, SCATS Region cannot terminate a walk at less than the controller minimum, regardless of the walk time specified in the SCATS data.

A walk minimum of more than 15 seconds will cause an inhibit (IH) alarm.

Overlap walks

There are two types of overlaps: a walk overlap and a clearance overlap. A controller specified walk overlap can operate as either a walk or clearance overlap in SCATS. A pedestrian movement with only a clearance overlap can never be specified as a walk overlap as this will cause the site to go to fallback with a forced fallback (FL) alarm.

Walk overlap

The phase(s) into which the walk can overlap must be specified in the walk data, e.g. `W1=8AB!` for a walk that can overlap into A or B phase, including AB and BA directions. When the next phase is not green for the walk, the walk termination signal will be sent at the time specified in the site data. However, if the phase

length is not long enough to accommodate the walk and clearance, the walk termination signal will be sent at a time of minus clearance from the end of the phase.

If an overlap phase is next in sequence, but is not demanded, SCATS Region will leave the walk running until minus clearance to give the overlap phase a chance to be demanded. Also see the SN region option.

Clearance overlap

If a walk cannot overlap into another phase, but its clearance can, an asterisk (*) must follow the phases into which it can overlap, e.g. `W1=8AB*!` The walk will now terminate after 8 seconds and the clearance can overlap into either A or B phase (whichever comes next). If the next phase is not an overlap phase, the walk acts like a non-overlap walk.

Secret walks

If a site has a secret walk, unknown to SCATS Region, no data relating to the walk is to be entered in the site data. If a walk can introduce secretly in a phase then overlap to another phase in which it then becomes known to SCATS Region, the phase in which it can secretly introduce should not be entered in the site data.

Demand-terminated walks

If the walk or clearance cannot overlap, do not specify any phases unless the walk is to be demand terminated, e.g. `W1=8A!` for an A phase walk (say with no push button and automatic introduction) that will terminate after 8 seconds provided another phase is demanded. If no other phase is demanded, the walk will stay green. If the phase is not specified, the walk will terminate regardless of any other demand being present.

One-way overlaps

A walk may be allowed to overlap only when a specific sequence occurs. The phase into which the walk is allowed to overlap is entered in the SCATS walk data, but the phase into which it is not allowed to overlap is not entered, e.g. if walk 3 is allowed to overlap from C to D phase, but not from D to C phase, enter `W3=8D!`

Enter `W3=8D*!` if the clearance but not the walk can overlap to D.

Walks at slaved sites

Do not use a negative walk for the stretch phase at a slaved site unless the pedestrian clearance is less than the slave offset, as the end of this phase is controlled by the master site.

Pedestrian movement termination

`W1T=`*y*`!` y is the time in seconds required by the controller to reach the next phase when the walk termination signal and the phase termination signal are sent simultaneously by SCATS Region.

Walk clearance time

The clearance time is used by SCATS Region for alarm timing and is the expected time for the return of green from the next phase when the walk clearance and not the phase intergreen determines the maximum time to reach the next phase.

This value is normally the sum of clearance 1 for the walk plus the greater value of either:

- walk clearance 2; or
- the phase intergreen (ECG+YEL+RED, which is stored in ‘AT’ for A phase, ‘BT’ for B phase etc.).

This is because the phase cannot step into intergreen (i.e. ECG or YEL) until clearance 1 has finished. Therefore the green time from the next phase will not arrive until clearance 1 plus the larger value of intergreen or clearance has timed off.

`TSC*?` Lists the values used by the controller.

If the clearance time used by the controller is four or more seconds shorter than the clearance time specified in the site data, a short clearance alarm (i.e. SC) will occur.

If the clearance time used by the controller is longer than the time specified in the site data, a long clearance alarm (i.e. LC) will occur if the walk clearance holds up the expected return of the green time from the next phase by more than six seconds.

If the green from the next phase is not received within sixteen seconds of the expected time, SCATS Region will send the site to its fallback mode and generate an LC and an FL alarm.

Walk termination signal

W1T=*y***'!** If the controller is not VC4 or greater, the walk clearance data must also include a single quote if the walk is to be terminated by the P- signal or a double quote if the walk is to be terminated by the P+ termination signal. Failure to specify the correct polarity signal will result in the non-termination of the walk, which will cause a forced fallback (FL) alarm.

For more information, see VD018-11 *Design principles for SCATS-controlled sites* available from Roads and Maritime Services.

Pedestrian movement features

From SCATS version 6.9.3, pedestrian movement features were added to allow for a greater range of pedestrian movement control. The general format for this command is:

W*n***F=[IW|SW|UW]!** Sets the pedestrian movement feature for pedestrian movement *n* to `IW`, `SW` or `UW`. These are mutually exclusive, as it does not make sense to select more than one feature. If no features are required, the feature is omitted. The individual features are described in the following sections.

Independent pedestrian movement

W1F=IW! Pedestrian movement 1 is independent.

This is used when the pedestrian movement is introduced and terminated independently of SCATS control. In this case, the duration of the walk and clearance are fixed times and these can still be specified using the `W`*n* and `W`*n*`T` commands.

Pedestrian movement introduced at start of walk

W1F=SW! Pedestrian movement 1 starts timing at the start of the walk intervals, rather than the start of the phase.

This is used when the pedestrian movement can be introduced late in the phase because there is no conflict with vehicles (late introduction), when the pedestrian movement can be reintroduced so that it can run multiple times in the phase (reintroduction) or when the pedestrian movement is introduced concurrently with a vehicle signal group rather than a phase.

Undefined pedestrian movement

W1F=UW! Pedestrian movement 1 is undefined.

This is used when the pedestrian movement is not used because there is a gap in the numbering sequence in the personality.

Offset plans

Offset plans define the offsets between sites in the same subsystem. Each site has four offset plans, PP1, PP2, PP3 and PP4, and each plan has two offset values. Offset plans are listed as part of the site data.

Offet plans for non-slaved sites

PP*n*=*a*,*b*^*c*! Defines a non-slaved site, where:

n is plan number – there are four offset plans in the site data – PP1 to PP4, and each has two offset values
a is the first offset value in seconds (within the range of +/– 127 seconds) from the subsystem CG=0 cycle generator zero reference point
b is the second offset value
c is the phase whose end is to be coordinated i.e. this phase is to finish at the specified offset value. If preceded by **^**, the start is coordinated

See the section 'Selecting offsets using PS' in subsystem data for explanation of selection of the a and b offsets.

Starting offsets

Use PP*n*=*a*,*b*^*c*!, where *c* is the phase.

Finishing offsets

The phase specified in the offset plan is the phase whose termination is to be coordinated.

Offset plan times must always relate to actual travel times. They are not like phase calls in Flexilink, which must allow for phase intergreens.

Phases to be coordinated will differ from system to system. However, in straight-line coordination, it is normal practice to coordinate either the start or the finish of the stretch phase.

It is advisable for all offset plans at the critical site in a subsystem to have identical values to prevent varying phase lengths due to rotation when different offset plans are selected, e.g. PP1=0,0C! in all plans.

Listing the active offsets

MP? Lists the active offset value (as modified by the subsystem cycle length and PS data), followed by the reference phase (i.e. PP:-12A).

A slave site is shown as 123SLB, where 123 is the master site, SL indicates slave and B is the trigger phase at the master that releases the slaved phase.

If the subsystem to which the site belongs can marry to another subsystem, the active link plan will be appended as in LP:17C345M. If the active link is zero or the selected offset is * (which means do not marry), the active link data is omitted.

M shows the subsystem is married to a subsystem within the region.

X shows the subsystem is married to a subsystem external to the region.

X/ shows an inactive external marriage.

Offset plans for slaved site

PP*n*=*x***SL***cp***!** Defines a slave site, where:

x is the offset in seconds and cannot be negative
SL is indicates a slaved site
c is the master site
p is the phase call at the master site that releases the slaved phase

SLA? List all slaved sites on the region.

For example, PP1=4SL1234C! releases the slaved phase 4 seconds after C phase is called at site 1234.

Offset plan selection when SK=SP

If the SP subsystem option is on (i.e. SK=+SP!), offset plans are selected based on the subsystem plan. When the SCATS Region selects a subsystem plan, it selects this based on the number of split plans defined for the critical site. Hence, the maximum subsystem plan will be 1, 4, 8 or 16.

When a user selects a subsystem plan (via command line, action list, variation routine or manual lock or trim), there are no restrictions. Hence the maximum subsystem plan will be 16.

Irrespective of how the subsystem plan was selected, the SCATS Region then uses this to select an equivalent offset plan at each site in the subsystem. The same selection mechanism is used, irrespective of whether the site is a critical site or non-critical site. As there are only 4 offset plans, plan pairing may be used to ensure that the selected offset plan is within the valid range.

When the SP subsystem option is on, offset plans are selected as follows:

```
if critical site maximum split plan number > 4
   if selected subsystem plan number > critical site maximum split plan number
      offset plan number = maximum offset plan number
   else
      use plan pairing to select offset plan number
   end if
else
   if selected subsystem plan number > maximum offset plan number
      offset plan number = maximum offset plan number
   else
      offset plan number = selected subsystem plan number
   end if
end if
```

Thus there are three ways in which the offset plan can be selected. The end result of the selection process is summarised in the following tables. These are colour-coded as follows:

n	offset plan number = selected subsystem plan number
n	offset plan number = plan number selected by plan pairing
n	offset plan number = maximum offset plan number

SCATS Region will only select subsystem plans above the thick line, but a user can select any subsystem plans.

Subsystem plan selected	Offset plan used where critical site has 16 plans	Offset plan used where critical site has 8 plans	Offset plan used where critical site has 4 plans	Offset plan used where critical site has 1 plan
1	1	1	1	1
2			2	2
3		2	3	3
4			4	4
5	2	3	4	4
6				
7		4		
8				
9	3	4		
10				
11				
12				
13	4			
14				
15				
16				

Offset plan selection where SP subsystem option is on

Site messages

Use one single quote followed by text to change the first message for the site.

Use two separate single quotes for message 2.

An access level of 6 is needed to change the first message line.

An access level of 4 is needed to change the second message line.

Notes

Chapter 5: Split plan data

Split plan data is the specification of the amount of green time to be allocated to each phase along with any special facility flags such as Y-, Z- and Z+ and phase features such as permanent demand, no gap etc. and the sequence in which the phases are to run. A site can have 1, 4, 8 or 16 stored split plans. Each site also has an active split plan.

A subsystem will select a system wide split plan, with each site using its own split plan, subject to plan matching.

Basic split plan operation

Listing split plan data

***n*!**	Set the site pointer to site *n*.
PL*n*!	Set the plan pointer to plan number *n* (similarly PL=*n*!).
PL!L!	Set the plan pointer to the active plan and list the plan data.
PL*n*!L!	Set plan pointer to plan number *n* and list data.
PL,L!	List the active plan without changing the plan pointer.
PL*n*,L!	List plan *n* without changing the plan pointer.
PL*!L!	List site data plus all plans vertically – set pointer to last plan.
PL*,L!	List site data and all plans without changing the plan pointer.
PL?	List the plan pointer.
PL*n*!EN!	Invoke auto prompt mode for entry of all items in split plan *n*.
PL*!EN!	Invoke auto prompt mode for site data plus data for all split plans.
PX!	List all split plans horizontally (including the active plan).

Individual items in a plan may be entered or amended by first setting the split plan pointer, then entering the item followed by its value.

For example, 123!PL1!C=33A!B=25C!

As confirmation, the system echoes the pointer after each item is entered.

Phase splits may be altered by B=+5! or C=-3! etc.

Split plan conventions

To assist in determining if the correct split plan is selected to suit prevailing traffic conditions, it is recommended to select phase splits so that:

- Plan 1 has phase splits to suit a morning peak demand.
- Plan 16 (or plan 4 in a 4-plan subsystem or 8 in an 8-plan subsystem) has phase splits to suit an evening peak demand.
- Plans 2–15 have evenly spaced phase splits between the peak plans to cater for differing demands between the peaks.

Special facilities

Each split plan has special facilities allowing the entry of DC, Y-, Z- and Z+. It is possible to add or remove selected items by using the + or - characters.

It also possible to change SF at all plans using PL=*! as well as list SF at all plans.

PL=0!SF=-DC!	Removes the DC phase feature from the active plan.
PL=1!SF=+Z-,-Z+!	Adds Z-, removes Z+ from plan 1.

PL=*!SF=!	Clears SF at all plans excluding the active plan.
PL=*!SF=-Y-!	Removes Y- from all plans excluding the active plan.
PL=*!SF?	Lists SF for all plans.

Copying split plans

Plans can be copied from any plan source to any destination plans.

Two methods are available.

- The source plan is set using the PL=*n*! command.
- The source is part of the command, using WR*m*=*n*! In this method, the plan pointer is changed to *m*.

The destination can include more than one plan. For example:

PL=0!WR=*!	Writes the active plan to all other plans.
PL=1!WR=*!	Writes plan 1 to all other plans, excluding plan 1 (itself) and the active plan.
WR2=*!	Writes plan 2 to all other plans, excluding plan 2 (itself) and the active plan.
WR8=1-4,6!	Writes plan 8 to plans 1 to 4 inclusive as well as plan 6.

If the command confirmation (CC) region option is on, you will always be prompted for command confirmation. Otherwise, writes from the active plan require command confirmation if the active plan is not part of the command. For example, WR=*! will prompt you for confirmation if the plan pointer (obtained by PL?) is a zero. This is done in case you have forgotten to set the source plan and it was not your intention to copy from the active plan. However, no confirmation is asked if you enter WR0=*! as the active plan source is part of the command.

Modifying split plan data

You can change data for a phase in all the stored plans at the same time. For example:

PL=0!B=+5!	Add 5 to the active plan B phase length.
PL=*!B=-5!	Subtract 5 from B phase in all plans. Note that PL=*! excludes the active plan.
PL=*!C=-TG!	Remove time gain from C phase in all stored plans (excludes the active plan).
PL=*!B=+FGNG!	Add false green and no gap to B phase in all stored plans.

Note that it is *not* possible to change data in a list of plans (e.g. PL=1,3,5!) or a range of plans (e.g. PL=1-5!). When using the wildcard plan selector (i.e. PL=*!), the command following the selector applies to all plans, then subsequent commands apply to the active plan until another plan selector is used. For example:

```
PL=*!A=15B!B=0PDC!C=20D!D=12A!
```

would apply A=15B! to all stored plans and B=0PDC!C=20D!D=12A! to the active plan. If you want the wildcard to apply to multiple commands, then you need to repeat the selector. For example:

```
PL=*!A=15B!PL=*!B=0PDC!PL=*!C=20D!PL=*!D=12A!
```

Listing all split plans

728!PX!

0:	1:	2:	3:	4:	5:	6:Z-	7:Z-	8:Z-
X:0	X:0	X:1	X:2	X:1-2	X:0	X:0	X:0	X:0
A=0PDFGB	A=0B	A=0B	A=0B	A=0B	A=0B	A=0B	A=43B	A=45B
B=20FGC	B=20C	B=22C	B=24C	B=27C	B=29C	B=31C	B=0C	B=0C
C=24ASTGD	C=24D	C=19D	C=24D	C=19D	C=24D	C=19D	C=24D	C=19D
D=1A	D=1A	D=1A	D=1A	D=1A	D=1A	D=1A	D=19#A	D=19#A

The first column shows the active plan. The remaining columns show the stored plans. The number of the remaining columns corresponds to the number of stored plans, i.e. 1, 4, 8 or 16. If there are 16 stored plans, plans 9 to 16 are shown in a separate block below plans 1 to 8.

The first row shows the plan number followed by a colon and any special features that are on. These are shown in the order Y-, Z+, Z- and DC. Due to limited space, the special facilities for stored plans may be

truncated. Use PL=*!SF? to show all special features for all plans without being truncated. A blank indicates that no special facilities are on.

The second row shows 'X' followed by a colon and any extra special facility (XSF) flags that are on. These are shown as a list. A contiguous range of flags is separated by a dash. A non-contiguous pair of flags (or range of flags) is separated by a comma. Due to limited space, the list of extra special facility flags may be truncated. Use PL=*!XSF? to show all extra special facility flags for all plans without being truncated. A zero indicates that no extra special facility flags are on.

The remaining rows show the split plan data. The format is described in a separate section below. The active plan includes the phase features that are on. These are shown in the order PD, NG, FS, AS, NS, TG and FG. The stored plans do not include the phase features. Due to limited space, the active plan's split plan data may be truncated. See below for listing the data for a single split plan or all split plans without data being truncated.

Listing a single split plan

Use PL0!L! to show the split plan data for all phases in the active plan. Use PL*n*!L! to show the split plan data for all phases in stored plan *n*. Use PL*!L! to show the split plan data for all phases in all plans. For example:

728!PL8!L!

```
I=728!PLAN=8!SF=Z-!XSF=1,3!
A=45ASTGB!
B=0PDC!
C=19FGD!
D=19#TGA!
```

where:

SF = special facilities (Y-, Z+, Z- and DC) and the remaining information shows the phase sequence, phase splits and phase features.

PL*!L! Lists all site and plan data in full.

Subsystem plan selection

When the SCATS Region selects a subsystem plan, it selects this based on the number of split plans defined for the critical site. Hence, the maximum subsystem plan will be 1, 4, 8 or 16.

When a user selects a subsystem plan (via command line, action list, variation routine or manual lock or trim), there are no restrictions. Hence the maximum subsystem plan will be 16.

Irrespective of how the subsystem plan is selected, the SCATS Region uses this to select an equivalent split plan at each site in the subsystem.

For the critical site, the split plan at that site is selected as follows:

```
if selected subsystem plan number > maximum split plan number
   split plan number = maximum split plan number
else
   split plan number = selected subsystem plan number
end if
```

For a non-critical site, the split plan at that site is selected as follows:

```
if selected subsystem plan number > maximum split plan number
   split plan number = maximum split plan number
else
   if maximum split plan number < maximum split plan number at critical site
      use plan pairing to select split plan number
   else
      split plan number = selected subsystem plan number
   end if
end if
```

Thus there are three ways in which the split plan can be selected. The end result of the selection process is summarised in the following tables. These are colour-coded as follows:

n	split plan number = selected subsystem plan number
n	split plan number = plan number selected by plan pairing
n	split plan number = maximum split plan number
*n**	as above, except that SCATS Region selects the wrong maximum split plan number

SCATS Region will only select subsystem plans above the thick line, but a user can select any subsystem plans.

Subsystem plan selected	Split plan used at critical site	Split plan used at 16-plan non-critical site	Split plan used at 8-plan non-critical site	Split plan used at 4-plan non-critical site	Split plan used at 1-plan non-critical site
1	1	1	1	1	1
2	2	2			
3	3	3	2		
4	4	4			
5	5	5	3	2	
6	6	6			
7	7	7	4		
8	8	8			
9	9	9	5	3	
10	10	10			
11	11	11	6		
12	12	12			
13	13	13	7	4	
14	14	14			
15	15	15	8		
16	16	16			

Plan selection where critical site has 16 split plans

Subsystem plan selected	Split plan used at critical site	Split plan used at 16-plan non-critical site	Split plan used at 8-plan non-critical site	Split plan used at 4-plan non-critical site	Split plan used at 1-plan non-critical site
1	1	1	1	1	1
2	2	2	2		
3	3	3	3	2	
4	4	4	4		
5	5	5	5	3	
6	6	6	6		
7	7	7	7	4	
8	8	8	8		
9	8	9	8	4	1
10		10			
11		11			
12		12			

Subsystem plan selected	Split plan used at critical site	Split plan used at 16-plan non-critical site	Split plan used at 8-plan non-critical site	Split plan used at 4-plan non-critical site	Split plan used at 1-plan non-critical site
13		13			
14		14			
15		15			
16		16			

Plan selection where critical site has 8 split plans

Subsystem plan selected	Split plan used at critical site	Split plan used at 16-plan non-critical site	Split plan used at 8-plan non-critical site	Split plan used at 4-plan non-critical site	Split plan used at 1-plan non-critical site
1	1	1	1	1	
2	2	2	2	2	1
3	3	3	3	3	
4	4	4	4	4	
5		5	5		
6		6	6		
7		7	7		
8		8	8		
9		9			
10	4	10		4	1
11		11			
12		12	4*		
13		13			
14		14			
15		15			
16		16			

Plan selection where critical site has 4 split plans

Subsystem plan selected	Split plan used at critical site	Split plan used at 16-plan non-critical site	Split plan used at 8-plan non-critical site	Split plan used at 4-plan non-critical site	Split plan used at 1-plan non-critical site
1	1	1	1	1	1
2		2	2	2	
3		3	3	3	
4		4	4	4	
5	1	5	5		1
6		6	6		
7		7	7	4	
8		8	8		
9		9	4*		

Subsystem plan selected	Split plan used at critical site	Split plan used at 16-plan non-critical site	Split plan used at 8-plan non-critical site	Split plan used at 4-plan non-critical site	Split plan used at 1-plan non-critical site
10		10			
11		11			
12		12			
13		13			
14		14			
15		15			
16		16			

Plan selection where critical site has 1 split plan

Split plan explanation – typical data

`413!PL8!L!`

```
I=413!PLAN=8!SF=Y-Z+!XSF=1,3!
A=22PDTGB!
B=0PDC!
C=25D!
D=14#A!
```

In line 1 (`I=413!PLAN=8!SF=Y-Z+!XSF=1,3!`):

`I=413!` means data is for site 413.

`PLAN=8!` means this is data for plan 8.

`SF=Y-Z+!` means Y- and Z+ special facilities are on. (Valid special facilities are Y-, Z-, Z+ and DC. Use `SF=!` to turn them all off.)

`XSF=1,3!` means XSF flags 1 and 3 are on for this plan.

In line 2 (`A=22PDTGB!`):

`22` means allocate 22% of the cycle length to A phase.

`PD` means place a permanent demand on A phase.

`TG` means use time gain (TG) on this phase to use unused time from phases between the stretch phase and this phase.

`B` means B phase is the next phase in sequence.

In line 3 (`B=0PDC!`):

`0` means that B phase is the stretch phase and will use all the time not used by the other phases and will not gap. Note that a bad data (BD) alarm will occur if the stretch phase is less than 5%.

`PD` means place a permanent demand on B phase.

`C` means C phase is the next phase in sequence.

In line 4 (`C=25D!`):

`25` means allocate 25% of the cycle length to C phase. (Note that a length of 1 is special and is used to ignore a phase.)

`D` means D phase is the next phase in sequence.

In line 5 (`D=14#A!`)

`14#` means allocate a maximum of 14 seconds to D phase when the cycle length is at or above alternate minimum cycle length. (The '#' symbol means use an absolute time and not a percentage.) At minimum cycle length, the phase is to receive 14%. If there is no alternate minimum cycle length, the phase will always get 14 seconds.

A means A phase is the next phase in sequence.

Split plan phase features

NS	No skip	Note that NS does not place a demand for the phase. A phase with NS on it will: ■ always run if it has a demand ■ always run if it has no demand provided that the controller has to pass this phase to get to another phase
AS	Anti skip	Do not skip this phase if the cycle length is greater than or equal to the double cycling threshold.
FS	Forced skip	Do not call this phase if cycle length is less than double cycling threshold. The time not used by this phase may go to: ■ the phase immediately before the FS phase if that phase has a false green ■ a phase between the FS phase and stretch phase that has a time gain ■ if none of the above, the stretch phase
PD	Permanent demand	The phase is automatically called every cycle. FS and NS cannot be entered on a phase with a PD. **Note:** A stretch phase should always have a PD unless the preceding phase has NGFGPD or any other phase in the sequence has NGTGPD.
TG	Time gain	On a secondary phase – unused time from phases following the stretch phase is gained by the phase with a TG. No time will be gained by a phase with TG if it is the next phase after the stretch phase unless the stretch phase is allowed to gap off (i.e. stretch phase has TG also) as all unused time is used by the stretch phase. On a stretch phase – allows it to gap – time not used by the stretch phase and other phases goes to a secondary phase that has TG. If no secondary phase has PDNGTG, the site will run random (VA). **Note:** A phase with TG and not NGTG is free to gap.
NG	No gap	The phase is not allowed to terminate early by expiration of the gap or waste timers. It will receive all the time allocated by the SCATS Region. The stretch phase has an automatic no gap unless time gain (TG) is on (see above), but can gap during false green from another phase unless NG is on. Also see RMN in 'Controlling low demand operation'. Each phase starts with gapping disabled. If the new phase does not have an NG (or if it is the stretch phase with a TG), the SCATS Region sends a 'gapping enabled' message to the site after the phase has been running for one second.
FG	False green	If no demand for the following phase, the active phase is allocated the following phases' time. A late demand is accepted for the next phase in sequence during false green, if the following phases' time is not a '#' time, and the current phase maximum counter exceeds the active phase clearance plus 10 seconds.
NGFG		Used on stretch phase to guarantee false green if the next phase is not required.
#		Indicates that the phase length is in seconds. Should only be used at a site that has a pedestrian only phase, where the walk and clearance time dictates the phase length, or for short clearance phases. At minimum cycle length, with alternate minimum cycle length specified, # on a phase is ignored, the time is used as a percentage.

Phase split as percentage of cycle length

For non-incremental split selection sites, minor phase percentages are calculated at stretch cycle length when cycle length exceeds stretch cycle length, with excess time above stretch cycle length going to the stretch phase. Phases at incremental split selection sites are always calculated at cycle length regardless. See also NS and NX subsystem options.

Entering split plan data

PL*n*!EN! Invoke auto prompt mode for entry of all items in split plan *n*.

WR=*n*! To enter identical plans, enter data for one of the plans, then use the command `WR=n!` to write the data to plan *n*.

PL*!EN! Invoke auto prompt mode for entry of all items in the site data and for all plans.

PL/ If a bad data (BD) alarm is present, enter `PL/` to reload the active plan.

AL/ Clear any bad data (BD) alarm generated when entering plan data.

Entering split plan phase data

B=26FGTGC! Set B phase split to 26%, set false green and time gain, set C phase to follow B.

B=26#FGC! Set B phase length to 26 seconds, set false green, set C phase to follow B.

B=33! Set B phase split to 33%.

C=33#! Set C phase length to 33 seconds.

D=+5! Increase D phase split or phase length by 5.

B=-3! Decrease B phase split or phase length by 3.

B=NS! Replace B phase features with NS.

A=+FG! Add FG phase feature to the active phase features for A phase.

C=-FGTG! Remove FG and TG phase features from the active phase features for C phase.

E=TGD! Replace E phase features with TG and replace next phase in sequence with D phase.

C=E! Set E phase to follow C.

A? List settings for A phase.

Double cycling a site

SF=DC! Double cycle the site when the cycle length is greater than or equal to the double cycling threshold.

Plan data for a double cycling site is specified the same as for a single cycling site.

Phase lengths specified in the plan will be calculated at cycle length / 2 when the cycle length reaches or exceeds the double cycling threshold.

If `DCL=0!`, a site with `SF=DC!` will always double cycle.

An incremental split selection site can be double cycled.

Example

For site 123 with a double cycling threshold of 100 seconds:

```
I=123!PLAN=1!SF=!   I=123!PLAN=2!SF=DC!
A=0PDB!             A=0PDB!
B=50A!              B=50A!
```

If the site is incremental split selection:

Plan 1 B phase will receive 50% of the cycle for any cycle length.

Plan 2 When the cycle length is below the double cycling threshold of 100 seconds, B phase will receive 50% of the cycle length. When the cycle length is greater than or equal to the double cycling threshold, the cycle will run twice (i.e. 50% of the cycle length per cycle) and B phase will receive 50% of each of the half cycles.

If the site is non-incremental split selection:

Plan 1 B phase will receive 50% of the cycle for any cycle length up to the stretch cycle length and 50% of the stretch cycle length when cycle length exceeds stretch cycle length.

Plan 2 When the cycle length is below the double cycling threshold of 100 seconds, B phase will receive 50% of the cycle length or 50% of the stretch cycle length (whichever is less). When the cycle length is greater than or equal to the double cycling threshold, the site will double cycle and B phase will receive 50% of each of the half cycle or the halved stretch cycle length (whichever is less).

It is not recommended to double cycle sites of more than two phases unless one of the phases is always very short as offsets will be unpredictable. Note that phases that go over-time will deduct that time from the next phase to run. This can produce short stretch phases.

XSF flags

Prior to SCATS Region version 6.8.3.1, each split plan had 16 XSF flags. From version 6.8.3.1, each split plan has 32 XSF flags. The extra XSF flags will only be sent to the controller if it is VC 6.1 or above.

The XSF flags are intersection personality dependant. Enter XSF flags with a comma between the flag numbers or use a dash to specify a range, e.g. `XSF=1,5-7!`

Slaving a site to another

A site may be slaved to the call of a phase at another (master) site. All data for slave operation is entered in the slave site only.

Slaved phase

The slaved phase is now specified using a 0 in the split plan data. This is identical to nominating the stretch phase at a non-slave site.

Slaved offset and master site

The slaved offset, master site and master phase call (which triggers a slaved phase) are specified in the offset plan data. For example:

`PP2=10SL1234B!`

where:

`PP2` means the site is a slave when running offset plan 2.

`10` means the slaved phase at this site will be released 10 seconds after the trigger from the master site – the range for an offset is 0 to +127 seconds.

`SL` means this is a slaved site on this offset plan.

1234 means the master site is 1234.

`B` means the call to B phase at the master site is the trigger that releases the slaved phase at this slaved site.

It is possible to have slaved and non-slaved operation depending on the selected plan.

Slave offsets can never be negative.

If the slaved phase has a walk associated with it, a negative walk may only be specified if the pedestrian clearance is less than the slave offset.

A slave site cannot be referenced by any subsystem link plan data for marriage purposes.

A site should only be slaved to another site when the start of the phase to be slaved to is unpredictable, due to phase skipping or gapping.

Example

Site 47 is to be slaved to site 32 so that A phase at site 47 finishes 15 seconds after A phase at site 32.

Master site 32	Slave site 47
3 phase, sequence is ABC	2 phase, sequence is AB
`AT=5!BT=6!CT=6!`	`AT=9!BT=6!`

The slave site (site 47) is to be a slave on all 4 plans, and must contain the following in its offset plan data:

- the desired offset
- the SL indicator
- the master site
- the phase at the master site whose call will release the slaved phase

The slaved phase is to be A phase, so this phase must have a length of zero in the split plans.

Slave offsets

Trailing offset

For a trailing offset for the ending of the A phases on a main road, it is probably better to coordinate the start of the yellows at each site. If the desired offset between the start of the yellows is 15 seconds, specify this value in the offset plan data at the slave site.

Starting offset

For a starting offset between the start of A phase at site 47 (the slave) and the start of the A phase at site 32 (the master), you will have to take the length of the preceding phase intergreens into account. For example:

If A phase at the slave site is to start 20 seconds after the start of A phase at the master site, and

- if when C phase is called at the master site, it takes 5 seconds to reach A phase (CT=5!)
- if when B phase is called at the slave site, it takes 9 seconds to reach A phase (BT=9!)

The offset is 20 + 5 – 9 or 16 seconds, which is entered in the offset plan data at the slave site.

Master phase

If the specified phase of the master is not demanded, the offset timing will commence at the moment that the phase would last have been given the opportunity to run, i.e.

- when the master moved into XT due to RMN
- when the trigger phase was skipped
- when the master stretch phase was reset (no FG or TG)

Caution must be exercised so that the master cannot issue two consecutive calls to the specified phase in less than the slave maximum cycle length.

Double cycling a slaved site

The slave site may include DC in the SF line if it is desired that the slave double cycle in relation to the master.

Note that when cycle length is at or above double cycling threshold, secondary phase lengths will be halved as described in double cycled sites. In the event of failure of the master site (e.g. ST, WD etc.), the slave will cycle at one or half cycle length depending on the DC phase feature and double cycling threshold.

When monitoring a slaved site, the stretch phase will be indicated with SL<>.

SLA? List all slaved sites on the region.

It is not recommended to double cycle sites of more than two phases, as offsets may be unpredictable.

Skipping unwanted phases

If a controller is capable of running more phases in some plans than in others or if it is equipped with more phases than is required, the unwanted phases must appear in the plan data with a phase split of 1% (or 1#).

If the phase is never to run, it should not be included in the desired phase sequence. However, there must be path back to the running phase sequence.

Example

Two split plans for a six-phase site are shown with only three phases required in plan 1, but in plan 2, all 6 are required.

```
PP1=0,0D!            PP2=0,0D!
I=999!PLAN=1!SF=!    I=999!PLAN=2!SF=!
A=0PDB!              A=0PDB!
B=25C!               B=25C!
C=15D!               C=15D!
D=1E!                D18E!
E=1F!                E=15F!
F=1A!                F=16A!
```

Plan 1 only runs A, B and C phases. Plan 2 runs all 6 phases.

Note: The referenced offset plan phase should be the same on all offset plans, even if the phase is dropped in some split plans.

Specifying unwanted phases

Sometimes, a site may have a phase that is never to run such as when an approach is blocked off to create a pedestrian mall. When a phase is never to run, it should be specified outside the required sequence, e.g. if C phase is never to run:

```
A=0PDB
B=20D!
D=30A!
C=1D!
```

Note that the next phase in sequence after the phase that is never to run in SCATS Region should be the one that the skipped phase can go to in Isolated or Flexilink operating modes.

Phase minimums

SCATS Region calculates and saves the dynamic minimum time for every phase at each site. It uses the same algorithm as the phase minimums in incremental split selection – that is, the value is stored in quarter seconds and is modified by one quarter of the difference of the save minimum and any new minimum.

`MIN?` Lists the minimum time (in seconds) for all phases at the monitored site.

Notes

Chapter 6: Subsystem data

Subsystems are groups of sites combined because of proximity, and when common cycle lengths will give optimum two-way progression.

All sites in a subsystem share a common cycle length, split plan number and link plan number, which is the basis of traffic signal coordination.

A subsystem can only have one critical site.

Listing subsystem data

SS=*n***!**	Set the subsystem pointer to subsystem number *n*.
SS=*n***!L!**	Set the subsystem pointer to subsystem number *n* – list data.
SS=*n***,L!**	List subsystem number *n* – does not alter subsystem pointer.
SS=*!L!	List all subsystems.
SS=*,L!	List all subsystems – does not alter subsystem pointer.
SS=*n***!EN!**	Invoke auto prompt mode for data entry of all items in subsystem number *n*.
SS?	List subsystem pointer.
SSV?	List vacant subsystem numbers.
SS=*n***!I?**	List all sites in subsystem *n*.
SS=*n***!SI?**	List all strategic inputs in subsystem *n*.

Individual items in a subsystem can be entered or amended by first setting the subsystem pointer, then entering the item followed by the new value, e.g. `SS=9!SCL=60,80!SK=!` As confirmation, the system will echo the subsystem pointer each time an item is entered.

Subsystem data locks

All SCATS and Flexilink data belonging to a particular subsystem is locked automatically to prevent accidental data changes when the last user logs off.

SSU=*n***!**	Unlocks data for subsystem *n*.
SSU!	Unlock subsystem for monitored site.
SSU/	Lock subsystem for monitored site.
SSU=*n***/**	Locks data for subsystem *n*.
SSU=*!	Unlock all subsystems.
SSU=*/	Lock all subsystems.
SSU?	List unlocked subsystems.

`*ERROR-LCK*` results when attempting to change data in an unlocked subsystem – excludes test sites.

Sample listing of subsystem data

`SS=12!L!`

```
SS=12!LCL=45!HCL=130!SCL=65,80!KCL=100,2!
SK=BF!
XCL=110!SZ=84,94!
FCL=30,40,45,60,75,80,90,95,100,110,115,120,125,130,135,140!
PS1=45^,65!PS2=100,120!PS3=95,115!PS4=100,120!
LP1=-30,-25C21!
LP2=-55,-45C21!
```

```
LP3=45,45C21!
LP4=35,31C21!
```

Subsystem data items

Definitions

SS=*n***!** — *n* is the subsystem number

LCL=*x***!** — *x* is the minimum cycle length. If alternate minimum cycle length is specified, LCL should be less than alternate minimum 1 cycle length. Cycle length jumps between minimum cycle length and alternate minimum cycle length are controlled by volume. See 'VF' in the sections Listing strategic approach data, VF cycle length control and strategic approach data.

HCL=*y***!** — *y* is the maximum cycle length

SCL=*a,b***!** — *a* and *b* are alternate minimum cycle lengths referred to as alternate minimum 1 cycle length and alternate minimum 2 cycle length. Alternate minimum cycle length is selected by volume and not degree of saturation. Under normal conditions, the cycle length will range between alternate minimum 2 cycle length and maximum cycle length, but under light traffic conditions, can drop to alternate minimum 1 cycle length and then to minimum cycle length, under the control of VF. (See Strategic approach data.) Both values can be zero, but if specified, alternate minimum 1 cycle length must be more than LCL but less than alternate minimum 2 cycle length, but alternate minimum 2 cycle length can be zero.

KCL=*cl,sp1,sp2***!** — Where *cl* is a cycle length in seconds, at or below which the nominated split plan pairs will receive no plan vote.

Example

KCL=80,2,4! means at cycle lengths of 80 seconds or less, subsystem plan 2 and 4 will not receive a vote (see plan pairs for KCL).

Plan pairs for KCL

Plan numbers specified in KCL affect one, four, eight and sixteen-plan sites. However, only plan numbers one to four can be entered in KCL. This means that for each KCL plan specified, four plans are affected at sixteen-plan sites and two plans are affected at eight-plan sites, as follows:

Split plan(s) affected at sites when the cycle length is less than or equal to KCL:

KCL plan	1-plan site	4-plan site	8-plan site	16-plan site
1	none	1	1 and 2	1 to 4
2	none	2	3 and 4	5 to 8
3	none	3	5 and 6	9 to 12
4	none	4	7 and 8	13 to 16

Allocation of subsystem to zone

A subsystem can be allocated to a zone for access control purposes. When a user tries to perform a subsystem-related command, the access level used to determine whether this is permissible is the higher of the region access level and the zone access level allocated to that user.

ZSS=*n*! — Allocates the subsystem to zone *n*, where *n* = 1 to 64.

ZSS=0! — Removes the subsystem from a zone.

ZSS=! — Same as above.

ZSS? — Shows the zone that the subsystem is allocated to.

Subsystem options

SK=AL! Use the average degree of saturation of all lanes in a strategic input with degree of saturation greater than zero. The default is to use the lane with the highest degree of saturation.

SK=AR! AR is derived from **A**verage **R**otation. This option enables an algorithm that minimises the overall rotation of sites in adjacent subsystems in a marriage tree by allowing the master subsystem to rotate. Empirical evidence suggests that this is a vast improvement over the previous algorithm. However, the improvement is reduced as the number of subsystems in the marriage tree increases and may not provide any improvement when the number of subsystems reaches about 10. It is therefore recommended that this option is set for all subsystems unless there are a lot of subsystems in the marriage tree or historical data shows no apparent improvement.

When the AR option is set, it is recommended that the SR option is also set.

SK=AS! Use the averaged degree of saturation from last three cycles for required cycle length instead of the degree of saturation from the current cycle.

SK=BF! Break fallback. Prevents fallback being passed to the subsystem to which this subsystem can marry.

SK=DD! Dynamic degree of saturation for split plan selection. Default is average degree of saturation.

SK=DF! Disable fallback.

SK=DI! Disable increment failure alarm.

SK=FC! If there is no controlling strategic approach, this option prevents SCATS Region from changing the cycle length. If not set, SCATS Region can adaptively change the cycle length, e.g. due to a marriage.

SK=FP! Include stored plan in incremental split selection plan voting. Default is incremental split selection generated plans only.

SK=FT! Fixed time.

SK=FU! Causes the value of VK in the strategic monitor lane data to be set to zero on the cycle in which an MF update occurs for that lane. This is used to track down unexpected values of MF and KP.

SK=GO! By-passes the ‘gain correction’ routine that uprates the highest lane degree of saturation of a strategic input if the strategic input green time exceeds the SD green time by SIg/SDg.

SK=IF! Subsystem reverts to fallback on an increment failure between 07:00 and 19:00. An increment failure occurs when no strategic approach in a subsystem produces a required cycle length for three successive cycles.

SK=LD! Enables the low degree of saturation operation controlled by the user-definable LDS low degree of saturation threshold and high degree of saturation threshold. The default LDS values are `LDS=70,80!`

The normal operation is equisat where SCATS Region equalises the degree of saturation on all voting approaches. The LD option modifies this by preventing non-stretch phases from receiving an increment if the highest degree of saturation of any plan voting approach drops below the low degree of saturation threshold. This is then maintained until the degree of saturation rises above the high degree of saturation threshold. See the `LDS` command.

SK=N1! For networks. Prevents PP1 and LP1 from being forced when cycle length=minimum cycle length (or alternate minimum 1 cycle length with alternate minimum 2 cycle length specified) and link plan equals 3. Default is forcing plan 1 offset plan and link plan at minimum cycle length (or alternate minimum 1 cycle length with alternate minimum 2 cycle length specified). Note that once forced, cycle length must rise above the highest alternate minimum cycle length to unforce.

SK=NA! Do not average required cycle length over last three cycles. Use dynamic required cycle length.

SK=NF! No failsafe VF. Cycle length can drop below alternate minimum 2 cycle length or alternate minimum 1 cycle length even though no mechanism exists to lift cycle length off minimum cycle length. Default is minimum cycle length if alternate minimum 1 cycle length and no VF" is specified or alternate minimum 1 cycle length if no VF' is specified. This option also

disables the setting of 'VF exceeded' when the weighted degree of saturation exceeds 95% even if the VF flow is not reached.

SK=NS! No stretch. Allow all non-stretch strategic approaches that increment cycle length to push cycle length to maximum cycle length, and all percentage phases to receive a percentage of cycle length even if the cycle length is greater than the stretch cycle length.

SK=NX! No stretch cycle length. All percentage phases are to receive a percentage of cycle length even if stretch cycle length is exceeded. Default is stretch phase only to receive time above stretch cycle length. Note that SZ still operates normally and that only stretch phase strategic approaches can push cycle length above stretch cycle length.

SK=OV! One vote. Under normal circumstances, a subsystem must receive two votes for the same subsystem plan within the previous three cycles before a plan change can occur. This avoids oscillation between plans on consecutive cycles. However, if the subsystem has more than two subsystem plans and is continually voting for different plans, a plan change may not occur as frequently as desired. If the OV option is selected, the subsystem can change to a different subsystem plan after only one vote (rather than two), providing the active subsystem plan has run for at least two consecutive cycles. This allows more frequent plan changes, but still avoids oscillation between plans on consecutive cycles.

SK=RR! Remove repeat. Automatically remove an incremental split selection repeat phase when its phase length drops below its minimum time. Default is that a user must supply alternate plans where the repeat phase does not run or alternatively forcibly skip the phase below a pre-define cycle length.

SK=SP! Offset plan follows split plan. Default is from link plan. Split plan will change only on 3 votes out of 4 instead of the default 2 out of 3 if SK=SP!

SK=SR! Subsystem rotation. When a subsystem is married and a plan change causes rotation, use the new method for adjusting the cycle length to get the cycle generator in step. The new method achieves coordination within one cycle if the rotation is between 0.8 and 1.33 times the cycle length. Outside this range, coordination is still achieved within two cycles, but the adjustment is done correctly compared to versions prior to 6.6.3.

SK=SV! Strategic plan selection based on volumes as indicated by VD flag or default VK. Default is from DS. SV normally goes with VK (default). If this option is selected, each strategic approach in the subsystem must have SD values for plan selection by volumes, e.g. SD=0,100,60,0! See strategic approach data, plan selection based on volumes.

SK=VO! Causes links (and volume voting strategic approaches) to use VO in lieu of VK for plan selection. This has no effect on LQ testing or VF testing that always use weighted VK.

Modifying SK data

Existing SK data can be modified by using plus and minus signs before the option to be added or subtracted. For example:

SK=+BF! Add BF subsystem option to existing options.

SK=-BFIF! Removes BF and IF options from existing options.

If nothing is entered for the SK, all defaults are assumed.

Options may be specified in any order. For example:

SK=SVSPBF! SV, SP, and BF options.

SK=SP! SP option only.

Stored cycle length plans

The FCL data contains sixteen cycle length plans that can be used in cycle length lock/trim, PM or FTP commands by nominating the position of the desired cycle length plan value in the table as a number between 1 and 16.

The purpose of cycle length plans is to allow scheduled entries in an action list to change cycle length by time of day in a fixed-time system. If the scheduled cycle length values need to be changed, they can be changed in the FCL table without any need to modify the action list.

As an example, CL=1! sets the cycle length to the first value in the FCL table. CL=3#! locks the third cycle length value in the table.

FCL command format

FCL?	List cycle length plans for subsystem of monitored site.
FCL4?	List cycle length plans for subsystem 4.
FCL*?	List cycle length plans for all subsystems.
FCL=30,40,50,60,70,80,90,100!	Set new values for subsystem of monitored site.
FCL4=30,40,50,60,70,80,90,100!	Set new values for subsystem 4.
FCL#8=125!	Set new cycle length plan 8 for subsystem of monitored site.
FCL1-3#8=125!	Set new cycle length plan 8 for subsystem 1, 2 and 3.
FCL1-3#8?	List cycle length plan 8 for subsystem 1, 2 and 3.
FCL=!	Leave existing plans untouched.

Stretch cycle length

XCL=*y*! Stretch cycle length. This is the threshold that is used to determine whether or not to apply the 'stretch effect'. The stretch effect is a method of allocating a greater proportion of time to the stretch phase. This works as follows.

If:

- the site is not running incremental split selection; and
- the NS susbsystem option is not set; and
- the NX subsystem option is not set; and
- the cycle length is greater than stretch cycle length; and
- the cycle length is less than maximum cycle length;

then the non-stretch phases will receive a percentage of the stretch cycle length and the stretch phase will receive whatever is left over.

For example, if a three-phase site has phase splits of 50%, 25% and 25% for A, B and C phases respectively, A is the stretch phase and stretch cycle length = 100 seconds, then the phase lengths will be 50, 25 and 25 seconds at a 100-second cycle length (no stretch effect), but 70, 25 and 25 seconds at a 120-second cycle length (with stretch effect). Note how the stretch phase receives all the extra time when the cycle length is greater than the stretch cycle length.

Cycle dependant offsets

Selecting offsets using PS

PS is used to specify the cycle lengths at which either of the two offset plan offsets and the two link plan offsets are to be selected. (See PP1...PP4 and LP1...LP4 in the sections Offset plans and Relation between PP, minimum cycle length, alternate minimum cycle length.)

- PS affects offset plan and link plan offsets in the same manner.
- PS values can be specified for each of the four offset plans and the four link plans.

Format:

PS*n*=*x*,*y*!

where:

PS*n* is PS number *n* for offset plan *n* and link plan *n* (i.e. PP*n*=*a*,*b*! and LP*n*=*c*,*d*!) *n* can be 1, 2, 3 or 4.

x is the cycle length below which offset plan *a* and link plan *c* are used.

y is the cycle length above which offset plan *b* and link plan *d* are used. *y* can only be greater than or equal to *x*.

There are two ways to determine the offset used at cycle lengths between the PS values of *x* and *y*.

- The default is linear interpolation between offset *a* and offset *b* for cycle lengths between *x* and *y*.
- If an 'up-arrow' symbol follows *x* (e.g. PS*n*=*x*^,*y*!), offset *a* will operate at cycle lengths below *x* seconds. Offset *b* will operate only when the cycle length rises to *y* seconds and will be maintained until the cycle length falls below *x* seconds, when offset *a* will operate.

If the SP subsystem option is not set, offset plans and link plans will follow the link plan votes.

If the SP subsystem option is set, offset plans and link plans will follow the split plan votes.

Slave offsets are fixed and are never modified by PS!

MP? List the dynamic offset determined by cycle length and PS.

Relation between offset plan, minimum cycle length, alternate minimum cycle length

Note: PP2 and PP4 can operate at minimum cycle length, alternate minimum 1 cycle length, or any cycle length between alternate minimum 1 cycle length and maximum cycle length.

- where alternate minimum 1 cycle length and alternate minimum 2 cycle length are both specified in linear systems, it will normally be appropriate to set PS values as follows:

```
PS1=LCL^,SCL1!
PS3=SCL2,0.9XCL!
```

If offset plans follow link plans, and LP3 is selected:

- PP1a will operate at minimum cycle length.
- PP1b will operate at alternate minimum 1 cycle length.
- PP3a will operate at alternate minimum 2 cycle length.
- PP3b will operate at 0.9 times the stretch cycle length.

PP3 will vary linearly between PP3a and PP3b as cycle length varies between alternate minimum 2 cycle length and 0.9 times the stretch cycle length. Note that the values of alternate minimum 2 cycle length and 0.9 times the stretch cycle length are suggestions only. PS3a should not be less than alternate minimum 2 cycle length.

Where alternate minimum 2 cycle length is not specified, the PS values should be:

```
PS1=LCL^,SCL1!
PS3=SCL1,0.9XCL!
```

This will cause PP1a to operate at minimum cycle length, PP3a to operate at alternate minimum 1 cycle length and PP3 to vary between PP3a and PP3b as cycle length varies between alternate minimum 1 cycle length and 0.9 times the stretch cycle length. Note that the values of alternate minimum 1 cycle length and 0.9 times the stretch cycle length are suggestions only. PS3a should not be less than alternate minimum 1 cycle length.

In these cases, directional bias values in the links (DBs) are only required for link plans 2, 3, and 4. When PP2 and PP4 (and LP2 and LP4) are selected by heavy unidirectional traffic, these will operate at all cycle lengths including minimum cycle length, alternate minimum 1 cycle length, alternate minimum 2 cycle length, and between alternate minimum 2 cycle length and maximum cycle length.

When PP3 is selected by a balanced flow of traffic, PP3a and PP3b will operate at alternate minimum 2 cycle length and above (or alternate minimum 1 cycle length and above if alternate minimum 2 cycle length is not specified) but PP1b will operate at alternate minimum 1 cycle length, and PP1a at minimum cycle length.

Note: If offset plan and/or link plan offsets are to be modified linearly by PS, note that small differences between PS' and PS" and large differences between PPa and PPb or LPa and LPb may result in large swings in offset linking between subsystems when cycle length is fluctuating between PSa and PSb. Hence large cycle length rotation may occur causing unpredictable stretch phase lengths.

Cycle length calibration factors

SZ is used to specify the values of degree of saturation that determine what cycle length is to run.

SZ=*b*,*c*! *b* and *c* are degree of saturation values, referred to as SZ1 and SZ2, where:

b – 10 gives a suggested cycle length equal to the highest alternate minimum cycle length. If alternate minimum cycle length is not defined, *b* – 10 gives a required cycle length of twice minimum cycle length

b gives a suggested cycle length of stretch cycle length

c gives a suggested cycle length of maximum cycle length, provided that either:

the degree of saturation came from a strategic approach that includes the stretch phase in its SD specification

SK=NS! which allows non-stretch strategic approaches to push cycle length to maximum cycle length

SZ-related data

SZ2 must always be greater than SZ1.

Only even values can be entered.

Default values, selected by entering SZ=! are 96 and 110.

Non-stretch phase approaches have degree of saturation limited to the value of SZ1, provided the NS subsystem option is not set.

Link plans

A link plan specifies a directional offset between one subsystem and another subsystem.

Internal link

LP*n*=*a*,*bcd*! Link plan data for each plan, where:

n is the link plan number 1, 2, 3 or 4.

a is the first link plan offset – range = –127 to +127 seconds. Use an asterisk instead of a numeric value to specify that the link is to be broken – useful for breaking a link based on cycle length.

b is the second link plan offset – range = –127 to +127 seconds. Use an asterisk instead of a numeric value to specify that the link is to be broken – useful for breaking a link based on cycle length.

c is the end of phase to which the link refers.

^*c* is the start of phase to which the link refers.

d is the site from the subsystem to which linking is required.

Note that a subsystem will not marry if the link plan data is zero, e.g. LP1=0!

Example

LP1=5,-12A23!

where:

LP1 is link plan number 1

5 is the first offset (selected by PS) – the subsystem cycle generator will be at zero 5 seconds after the end of the nominated phase.

-12 is the second offset (selected by PS) – the subsystem cycle generator will be at zero 12 seconds before the end of the nominated phase.

A is the nominated phase, the end of which is referenced for determining the link offset.

23 is the site in another subsystem to which this subsystem is to link. No X is appended, so the link is internal.

Linking to another region

The format is the same as an internal link. However, specify a site from a subsystem in another region and append the letter X to inform SCATS Region that the link is external. For example:

```
LP4=21,7C1234X!
```

ERROR-ILL during link plan entry

All entry of link plan data is checked for an illegal marriage (e.g. a closed loop as in a subsystem that marries to itself or a group of subsystems that form a circle when married) and will be rejected with an `*ERROR-ILL*` if such marriages could occur.

Link plan conventions

To aid in determining if a link plan is operating in accordance with traffic conditions, it is recommended to use to following plan number conventions:

LP1 Operates at low cycle lengths, usually at night. By default, if link plan 3 is selected, SCATS Region forces link plan 1 when the minimum cycle length is operating. However, link plan 2 and link plan 3 can both operate at minimum cycle length.

LP2 Operates when traffic is heaviest in the morning peak direction.

LP3 Operates when traffic flow is balanced – referred to as the business peak plan.

LP4 Operates when traffic is heaviest in the afternoon peak direction.

By using a plan numbering convention, someone travelling through a system is more easily able to check if the expected link plan is operating for the prevailing traffic conditions.

For historical reasons, Sydney uses LP4 for a.m. and LP2 for p.m. directions.

Default link plan on startup

If SCATS Region is restarted (i.e. after a power failure or a reboot), SCATS Region starts with a cycle length of stretch cycle length (if no stretch cycle length, then maximum cycle length), split plan 1 and link plan 3.

Chapter 7: Strategic input data

A strategic input is a group of detectors that are used to collect detector counts and non-occupancy data. This data is used in the calculations that help to determine subsystem plan and link plan selection.

A strategic input is associated with a site. The site and the strategic input at that site are collectively referred to as a data source.

A strategic input normally has 1 to 4 detectors in adjacent lanes. The detectors selected should be those that are important enough to contribute to strategic decisions. Detectors that are not important enough to contribute should be allocated to a different strategic input or not allocated at all.

Each strategic input is specified by:

- a strategic input number (1 to DISI)
- the site at which the strategic input is located (1 to 64999)
- the collection period (described below)
- the detector numbers to be monitored at that site (1 to 48, depending on VC number)

The collection period is the period during which data is collected. This may be one of the following:

- one or more phases
- a signal group number
- a timed interval

In the case of phases, data collection restarts at the beginning of each cycle (usually the start of the stretch phase) and is collected during all the phases specified, including the running intervals and the clearance intervals of those phases.

In the case of a signal group number, data collection restarts at the beginning of each cycle (usually the start of the stretch phase) and is collected when the signal group is green plus an extra 5 seconds after the green finishes.

In the case of a timed interval, data collection restarts at the start of each interval and is collected for the whole of the interval.

Note

It is possible to have a strategic input with no detectors, but this is only useful for showing the elapsed time of one or more phases or a signal group in the strategic monitor when these would not ordinarily be shown. In this case, the strategic input must still be allocated to a strategic approach.

Listing strategic input data

SI=*n***!**	Set strategic input pointer to strategic input number *n*.
SI=*n***!L!**	Set strategic input pointer – list strategic input number *n*.
SI=*n***,L!**	List strategic input number *n* without altering the strategic input pointer.
SI=*!L!	List all strategic inputs.
SI=*,L!	List all strategic inputs without altering the strategic input pointer.
SI?	List the strategic input pointer.
SI=*n***!EN!**	Invoke auto prompt mode for entry of all items in strategic input number *n*.
SI*n***=!**	Delete all data for strategic input number *n*.
SIV?	List those strategic inputs not yet allocated to a site.

Individual items in a strategic input may be entered or amended by first setting the strategic input pointer, then entering the item followed by its value, e.g. `SI=22!D#=1,2,3!` As confirmation, the system will echo the strategic input pointer after each item is entered.

To change the nominated phase or signal group for a strategic input, enter data in the same format as it is listed, e.g. `SI22=11AB!`

Note: If the detector specification of a strategic input is changed, check the strategic approaches and links using the strategic input for active detector changes.

Listing strategic approaches and links using a strategic input

SI=*n*!SA,L! Lists strategic approaches used by strategic input *n*.

SI=*n*!LK,L! Lists links used by strategic input *n*.

Deleting a strategic input

Do not delete strategic inputs without first checking for strategic approaches and links using the strategic input. Check all action lists for any reference to the strategic input.

Strategic input listing

The following data is obtained by typing `SI=n!L!` where *n* is a strategic input number.

```
SIn=yz!D#=a!
MF=b!NF=c!
KP=d!AV=e!
```

where:

SI Strategic input *n* belongs to site *y* and gathers data when *z* phases are running. *z* may be one or more phases. If a phase is not valid for that site, `*ERROR-PHS*` occurs.

D# Detector numbers at the site forming this strategic input. A strategic input can have between 0 and 4 detectors:

- A comma separates data for individual lanes in all cases.
- These numbers must be unique for the referenced site and must not occur in any other strategic input. If not, `*ERROR-NUM*` occurs.
- If a strategic input has no site pointer, `*ERROR-PTR*` occurs.
- Enter 0 if the strategic input is to have no detectors, e.g. the strategic input is to be used by a strategic approach for displaying phase green time in a strategic monitor.

MF Maximum flow (self-calibrating) for each lane where 0 defaults to 1698. A comma separates the data for each lane. If a lane is under-saturated (i.e. non-occupancy associated with daily MF' and KP' is greater than 1.5 seconds), SCATS Region estimates the new MF and marks it with an asterisk (*).

If a self-calibrating MF is not required, a static value, marked with a '#', may be entered, e.g. `MF=1650#,1820!` Any lane of a strategic input so marked, will not produce an SI alarm at midnight, but will show an SI alarm if a DA occurs on the lane.

A + preceding an MF indicates an SI alarm on that lane. Entering an MF value will clear an SI alarm for that lane.

NF Lane calibration factors for degree of saturation (DS' = DS × NF / 100). A comma separates the data for each lane. Zero is the default value and is the same as entering 100.

KP This is the average occupancy specified in deciseconds per vehicle. A comma separates the data for each lane. When creating a new strategic input, the default value is 0. This is automatically changed to 112 when the maximum flow is calculated at midnight. If the maximum flow is locked (MF data is followed by #), KP is not recalculated.

AV Average daily lane volumes for weekdays only. A comma separates the data for each lane.

Strategic input data entry errors

ERROR-NUM	Detector number already used in another strategic input.
ERROR-PHS	Illegal phase specified in strategic input.
ERROR-PTR	No strategic input pointer (i.e. `SI=3!`) specified yet.

Associated strategic input commands

`MF'?`	List the daily best MF.
`MF'=0,,0!`	Clear the best MF for lanes 1 and 3. Note that zero is the only valid entry.
`KP'?`	List the KP associated with MF'.
`KP'=,0!`	Clear the KP' value in lane 2. Note that zero is the only valid entry.

Sample strategic input listing

`SI=16!L!`

```
SI16=11BD!D#=4-6!
MF=1625,1780,1532!NF=0,0,0!
KP=110,98,122!AV=13004,15321,12038!
```

where:

16 is strategic input number 16.

11 is site 11.

BD is data collected during B and D phases (including the intergreen).

4-6 is detectors 4, 5 and 6.

1625,1780,1532 is the average maximum flows in each lane.

0,0,0 is the bias factors for each lane (default is 100).

110,98,112 is the average occupancy per lane.

13004,15321,12038 is the daily average flows (Mon–Fri) in each lane.

Entering detectors for a strategic input

Enter detector numbers using any of the following formats:

D#=1,3,5!	Specify detectors 1, 2 and 3 for the strategic input – previous specification will be replaced.
D#=1-3!	As above, but for detectors 1 to 3 inclusive.
D#=+4!	Add detector 4 to strategic input.
D#=-2!	Delete detector 2 from strategic input.
D#=-1,+2!	Delete detector 1, add detector 2.
D#=!	Delete all detectors from strategic input.

Defining a strategic input for signal group operation

Signal group specification is required for sites that use conditional overlaps or where one phase has several possible movements or conditional pedestrian or vehicle movements, such as in single diamond overlap and double diamond overlap phasing.

If a signal group may be red during any part of a phase in which strategic input data is to be collected, the signal group specification of the strategic input must be used.

Defining a signal group for a strategic input

SI*n*=*y*,*z*!

where:

n is the strategic input number

y is the site

z is the signal group number (1 to 16)

Example

`SI=7!L!`

```
SI7=23,12!
```

where:

SI7 is strategic input number 7

23 is site 23

12 is signal group number 12

Note: Five seconds is added to the on time for the signal group to simulate the intergreen period for a phase.

Listing signal group colours

SG? This lists the signal groups that are green. For a site with a VC5.1 controller, the list is followed by the colours of each signal group.

Example

For a site with a non-VC5.1 controller:

`I=123!SG?`

```
1,5,10-11 I=123.
```

For a site with a VC5.1 controller:

`I=270!SG?`

```
4,7-8 I=124.
1:R 2:R 3:R 4:G 5:R 6:R 7:G 8:G .
```

where:

F = flashing

R = red

Y = yellow

G = green

blank = off

These may be provided in any combination to reflect the actual signal group colours. For example, a red/yellow display (as used in the United Kingdom and Hong Kong) would show `1:RY`. A flashing don't walk pedestrian signal group would show `8:FR`.

Note: The `F` indicates a flashing status. If the flashing is implemented using an algorithm, rather than a state, then the actual colour is shown rather than an `F`.

Note: No distinction is made between vehicle and pedestrian signal groups.

Defining a timed strategic input

SI*n*=*y*,*z*#!

where:

n is the strategic input number

y is the site

z is the duration of the collection period (10 to 250 seconds)

Example

SI=7!L!

```
SI7=23,12!
```

where:

SI7 is strategic input number 7

23 is site 23

12 is signal group number 12

Notes

Chapter 8: Strategic approach data

Strategic approaches optionally control split plan selection and cycle length control for a subsystem.

Where possible, it is recommended that strategic approach numbering follows the convention of odd numbers for heavy a.m. direction and even numbers for heavy p.m. traffic direction.

Listing strategic approach data

SA=*n***!**	Set strategic approach pointer to strategic approach number *n*.
SA=*n***!L!**	Set strategic approach pointer – list strategic approach number *n*.
SA=*n***,L!**	List strategic approach number *n* without changing the strategic approach pointer.
SA=*!L!	List all strategic approaches.
SA=*,L!	List all strategic approaches without changing the strategic approach pointer.
SA?	List the strategic approach pointer.
SA=*n***!EN!**	Invoke auto prompt mode for entry of all items in strategic approach number *n*.
SA*n***=!**	Delete all data for strategic approach number *n*.
SAV?	List vacant strategic approach numbers.

An individual item in a strategic approach may be entered or altered by first setting the strategic approach pointer then entering the item followed by its value, e.g. SA=14!S^=22! The system will echo the strategic approach pointer each time an item is entered.

Lane data for a strategic approach cannot be entered if the strategic input for the strategic approach is not set up before the strategic approach. Deleting detector data for a strategic input that is currently being used by a strategic approach or link will also delete the lane specification data in the strategic approach or link. Conversely, adding detector data will add a comma (,) to the lane specification in the strategic approach or link.

Listing strategic approach data

Entering SA=*n*!L! (where *n* is a strategic approach number) will give:

SA*n*=*y*#^!S^=*z*!VF=*a*,*b***!VK=*w*!SD=*cde*!

where:

SA*n*=*y*#^! shows that:

n is the strategic approach number

y is the subsystem number

prevents the strategic approach from voting for split plans

^ prevents the strategic approach from contributing towards adaptive cycle length but does not prevent it selecting minimum cycle length provided that the strategic approach has VF data

Note: A strategic approach whose SD refers to a phase specified in seconds, should always include an '^', as the degree of saturation from this approach is ignored for cycle length control.

S^=*z*! references strategic input number *z*.

VF=*a*,*b****! defines the alternate minimum 1 cycle length/alternate minimum 2 cycle length selection volumes (VF1 and VF2) and the active lanes, where:

a is VF1, an average flow, which, if exceeded, causes the minimum cycle length to be alternate minimum 1 cycle length. VF1 can be specified with a zero VF2. If VF1 is zero, VF2 must be zero.

b is VF2, an average flow, which, if exceeded, causes the minimum cycle length to be alternate minimum 2 cycle length. If VF2 is wanted, it must be bigger than VF1, which must not be, zero. If a strategic approach is not to control minimum cycle length use `VF=0,0!`. Note that `VF=`*`a`*`,`*`b`*`!` retains the `***` as previously defined.

`***` define the active lanes in the strategic input. A comma marks a lane that is to be ignored in the strategic input, e.g. `VF=4,8**,!`

`VF=0,0!` if the nominated strategic input has no detectors but the strategic approach is to be used in strategic monitor data collections to obtain the phase or signal group length each cycle, specify zero VF data as shown.

Weighted VK (0.45% current VK + 0.33% VK–1 + 0.22% VK–2) is used for 'VF exceeded' tests and is not modified by any strategic approach calibration value.

VF cycle length control

`LCL` is the minimum cycle length, but alternate minimum 1 cycle length and alternate minimum 2 cycle length are alternate minimums selected by volume. The specific approach volumes that control the selection of these alternate minimums are referred to as VF factors, with VF1 for alternate minimum 1 cycle length and VF2 for alternate minimum 2 cycle length. Not all approaches need VF volumes. Of those that do, it only takes one approach to have VF1 exceeded to set minimum cycle length to alternate minimum 1 cycle length. Similarly, if the optional alternate minimum 2 cycle length is specified, it only takes one approach to have VF2 exceeded to set the minimum cycle length to alternate minimum 2 cycle length. This makes it easy for cycle length to go up from minimum cycle length to alternate minimum 1 cycle length to alternate minimum 2 cycle length.

To prevent oscillation, a form of hysteresis is adopted. For a subsystem cycle length to drop from alternate minimum 1 cycle length to minimum cycle length, the volume per cycle if minimum cycle length was selected must be less than half VF1 on all approaches. Similarly, to drop from alternate minimum 2 cycle length to alternate minimum 1 cycle length, the volume if alternate minimum 1 cycle length was selected must be less than half VF2 on all approaches.

If your VF volumes are too low, the subsystem will have difficulty in dropping to minimum cycle length. If VF volumes are too high, the subsystem will have difficulty in getting off minimum cycle length as the green time may not be long enough to allow the VF volume to be exceeded. If parking reduces the number of lanes contributing to the volume required to exceed a VF, use a volume that relates to the effectively used lanes and the green time available at the critical site of the subsystem at minimum cycle length.

The average reconstituted volume (VK) is used for VF comparison. The average reconstituted volume is the cyclic flow for the strategic approach (or link) for lanes marked with '*', converted to units of vehicles / 180 seconds (by dividing by cycle length and multiplying by 180, i.e. vehicles per hour / 20) and averaged with the result from the previous cycle.

Failsafe VF control

To prevent a subsystem remaining at minimum cycle length or alternate minimum 1 cycle length because you forgot to enter any VF volumes at all, SCATS Region adopts a failsafe mode of operation. If alternate minimum 1 cycle length is defined and no VF1 volumes exist, the minimum cycle length will be alternate minimum 1 cycle length. Similarly, if alternate minimum 2 cycle length is defined and no VF2 volumes exist, alternate minimum 2 cycle length will be the minimum cycle length.

This facility can be disabled with NF subsystem option.

Detector numbering in a strategic input

Note that the detector numbers will appear in ascending order in a strategic input and may not agree with the left, middle and right lanes. For example, if detector 11 is the left lane, detector 12 is the middle lane and detector 9 is the right lane, the strategic input will store these detector numbers in the order 9, 11, 12. The left detector in the strategic input (number 9) will not be the left lane on the road.

Strategic approach calibration factor

VK=*w*! '*w*' is the strategic approach calibration factor and is the percentage of the degree of saturation to be used by this strategic approach for split plan voting (does not affect cycle length). The default is 100%, e.g. VK=0! is 100%, VK=95! is 95%.

An '^' on VK (e.g. VK=0^!) will be automatically generated, if the S^ site is not the same as the SD site, i.e. the plan voting DS' = DS × VK / 100.

Note: A projected degree of saturation above 160% is ignored for plan voting.

The calibration factor is also applied to flows for volume voting subsystems, but is not applied to the weighted VK flow used for 'VF exceeded' tests.

Plan voting factor

The SD specifies the effective green time (i.e. plan voting factor) considered for subsystem plan voting for up to three phases. The effective green is the total time for the phase(s) at the critical site that benefits the traffic on this approach.

SD=*n*A10B10!

where:

n is the critical site (a subsystem can only have one critical site).

A10B10 are the phases that benefit the traffic being measured on the strategic input for this strategic approach are A phase, 100% (A10) and B phase, 100% (B10). Percentages are expressed as 10% of the actual value, i.e. 0 = 0%, 1 = 10%, 2 = 20% etc.

If not prevented by the '^' specification, the strategic approach also contributes to cycle length control. If any phase in the SD is the stretch phase in the active split plan, the strategic approach can push cycle length above stretch cycle length, otherwise its degree of saturation contribution is limited to SZ1, which allows the strategic approach to push cycle length only to stretch cycle length (subject to absence of SK=NS). If any phase in the SD is specified in seconds (#) in the active split plan, the strategic approach will not contribute to cycle length control.

The stretch phase can be included with a percentage of 0 (e.g. A0) to allow a non-stretch phase approach to push cycle length above stretch cycle length. In this case it is usual to allow the stretch phase can gap off (add TG). The unused stretch time must go to the non-stretch phase (with A0) and a permanent demand, no gap, time gain (PDNGTG) must be added to the non-stretch phase to use up the spare time from the stretch phase so that offsets are maintained.

The SD data for all plan voting strategic approaches in a subsystem must reference the critical site for that subsystem. It is the critical site that has the phase split arguments. Because of this, each subsystem can only have one critical site.

A strategic approach that only controls cycle length (i.e. has a #) need not have any green time percentage following the nominated phase in the SD as this percentage is only required for plan voting. For cycle length control, the phase is only required to indicate if the cycle length can only increase up to stretch cycle length (i.e. stretch phase not specified) or up to maximum cycle length (stretch phase specified). If the specified phase is in seconds (#), no increment can take place and hence is ignored for cycle length control and as such, should not be used, e.g. SD=17C0! or SD=17A0C0!

Note: For non-incremental split selection, SD votes should be checked by running an SB monitor for each strategic approach. If the plan votes (first 4 figures) are not in proportion or are all equal, the strategic approach is useless for plan voting.

Sample listing of strategic approach data

SA=16!L!

```
SA16=5!S^=22!VF=8,14**!VK=95!SD=17B10!
```

where:

16 is strategic approach number 16

5 controls subsystem number 5

22 means it derives data from strategic input 22

8 is alternate minimum 1 cycle length volume control

14 is alternate minimum 2 cycle length volume control

,** specifies that the first lane of the strategic input is to ignored, as signified by a comma in the first character position. The remaining two lanes in the strategic input are to be used, as shown by the two asterisks.

95 is for plan selection, degree of saturation (or volume if splits selected by volume) is multiplied by 0.95.

17B10 means plan voting uses 100% (10) of B phase at site 17.

Plan selection based on volumes

When the degree of saturation cannot be used from an approach for effective plan voting, plan selection can be based on volumes from each approach by setting the SV subsystem option. Data is selected depending on the state of the VO subsystem option. If the VO subsystem option is clear (the default and recommended setting), then selection is based on reconstituted volume (VK). If the VO subsystem option is set, then selection is based on measured volume (VO).

For plan selection based on volumes, all strategic approaches for the subsystem must have offset performance values (and not effective green time values), in the following format:

SD=w^,x^,y^,z^!

where:

w is the prediction of plan performance for plan 1, '*x*' for plan 2 etc., e.g. SD=44,0^,66,100!

^ (if included) means the strategic approach will only increase cycle length up to stretch cycle length on the plan that has the ^.

The ^ should be included on the plans where the strategic input for the strategic approach is not on the stretch phase.

The default is SD=0^,0^,0^,0^! entered with SD=!

Chapter 9: Link data

Links control the selection of a link plan for linking one subsystem to another subsystem. A link plan can optionally be used to select offset plans for offsets between sites within a subsystem.

Where possible, it is recommended that links be numbered to follow the convention of odd numbers for heavy a.m. traffic and even numbers for heavy p.m. traffic direction.

Listing link data

LK=*n*!	Set link pointer to link number *n*.
LK=*n*!L!	Set link pointer to link number *n* and list data.
LK=*n*,L!	List link number *n* without changing the link pointer.
LK=*!L!	List all links. The link pointer will be set to the last link.
LK=*,L!	List all links without changing the link pointer.
LK?	List the link pointer.
LK=*n*!EN!	Invoke auto prompt mode for entry of all items in link number *n*.
LK*n*=!	Delete all data for link number *n*.
LKV?	List vacant link numbers.

Individual items in a link may be entered or amended by first setting the link pointer, then entering the item followed by the new value, e.g. LK=2!L^=2! As confirmation, the system will echo the link pointer for each item entered.

Note: Link data cannot be entered if the strategic input nominated for the link is not set up. Changing the number of detectors specified in a strategic input will also alter the lane specification in a link or strategic approach using that strategic input. If a strategic input being used by a link or strategic approach is deleted, the lane specification data in the link or strategic approach will also be deleted.

Listing a link

LK=*n*!L!

Lists data for link number *n*. This gives:

```
LKn=y^!L^=z!LQ=v*,*!VB=w!DB=a,b,c,d!
```

where:

LK*n*=*y*^! means link *n* controls subsystem *y*. The ^, if present on any link in the subsystem, disables the required cycle length comparison in divorce voting for the whole subsystem.

L^=*z*! means the link uses data collected by strategic input *z*.

LQ=*v**,*! means the link queue data specifies an optional volume (*v*) for marriage/divorce control, as well as defining the active lanes from the strategic input.

If a subsystem is currently divorced and its cycle length is within +/-10 seconds of the subsystem that it wants to marry, it votes to marry.

If a subsystem is currently married and its required cycle length is outside +/-10 seconds of the subsystem that it is married to, it votes to divorce.

Only the four most recent votes are considered. When there are four votes to marry, a marriage occurs (or is maintained). When there are four votes to divorce, a divorce occurs (or is maintained). When there is a mixed number of votes to marry or divorce, no change occurs.

In SCATS Access, the marriage counter shows the number of votes to marry. From version 6.9.4, the Married/Divorced button shows a tooltip with a history of the marriage/divorce votes, where '+' is a vote to marry and '-' is a vote to divorce.

A volume may also be used to assist in marriage/divorce control. Weighted VK (0.45 × VK + 0.33 × VK' + 0.22 × VK") is used for 'LQ exceeded' tests and is not modified by any link calibration value.

LQ=0! If LQ is 0, volumes are not used to vote for marriage or divorce.

LQ=-1! If LQ is -1, the subsystem is permanently married.

LQ=34! If LQ is between 1 and 127, the value specifies a volume per cycle. If the weighted average VK exceeds this value, the subsystem marries.

LQ=1720! If LQ is between 400 and 4000, the value specifies a flow in vehicles per hour. If the weighted average VK extrapolated to a flow exceeds this value, the subsystem votes to marry.

LQ=-24! If LQ is between -2 and -127, the absolute value specifies a volume per cycle. If the weighted average VK exceeds this value, the subsystem votes to divorce.

Note: LQ other than -1 is disabled if the cycle length is less than the highest alternate minimum cycle length.

Required cycle length is now distributed through married subsystems if LQ is exceeded.

A link with an LQ of -1 does not require a strategic input number unless the link is to vote for a link plan.

Link active lanes

LQ=*v,*!** An asterisk marks a lane to be used from the strategic input. A comma marks a lane to be ignored.

Link calibration factor

VB=*w*! 'w' is the percentage of the volumes to be used. The default is 100%, e.g. `VB=0!` is 100%. `VB=105!` is 105%. This factor is not applied to volumes used for LQ testing.

Directional bias factors

DB=*a*,*b*,*c*,*d*! Directional biases – prediction of performance of each link plan for this link, a for plan 1, b for plan 2 etc.

Plan numbering convention. It is recommended to adopt:

Plan 1 Low cycle offsets

Plan 2 A.M. peak offsets

Plan 3 Business offsets

Plan 4 P.M. peak offsets. (For historical reasons, Sydney uses plan 2 for p.m. and plan 4 for a.m.)

For a 3-way (a.m., business, p.m. peaks) argument:

a.m. direction `DB=0,100,X,0!`

p.m. direction `DB=0,0,X,100!`

Note: To produce a link plan 2 or 4 vote, an AK volume exceeding 20 (i.e. 20 vehicles/3 mins) and an LP2:LP4 ratio of at least 2:1 must occur, otherwise a plan 3 vote will result.

A value of 100 represents the best plan for that approach. A value of X is nominated to select the appropriate link plan according to the ratio of the traffic flow in one direction compared with the opposing flow.

Formula: X = (100 × RATIO) / (RATIO + 1)

or RATIO = X / (100 – X)

X	Ratio	X	Ratio	X	Ratio	X	Ratio
50	1.0:1	58	1.4:1	66	1.9:1	74	2.8:1
52	1.1:1	60	1.5:1	68	2.1:1	76	3.2:1
54	1.2:1	62	1.6:1	70	2.3:1	78	3.5:1
56	1.3:1	64	1.8:1	72	2.6:1	80	4.0:1

Example

If link 1 has `DB=0,100,56,0!` (i.e. prefers link plan 2) and link 2 has `DB=0,0,56,100!` (i.e. prefers link plan 4), equal flows (i.e. 20 vehicles on link 1 and 20 on link 2) results in a vote for link plan 3. A flow of 25 on link 1 and a flow of 20 on link 2 still results in a vote for link plan 3 as the ratio of 25:20 is 1.25:1 which is less than the 1.3:1 ratio selected by a value of 56 for X (from the above table). However, a flow of 27 on link 1 and a flow of 20 on link 2 exceed the ratio of 1.3:1 (27:20=1.35:1) resulting in a vote for link plan 2.

Link	Flow	Link plan 1 DB × flow	Link plan 2 DB × flow	Link plan 3 DB × flow	Link plan 4 DB × flow
1	27 vehicles	0 × 27 = 0	100 × 27 = 2700	56 × 27 = 1512	0 × 27 = 0
2	20 vehicles	0 × 20 = 0	0 × 20 = 0	56 × 20 = 1120	100 × 20 = 2000
	Total	0	2700	2632	2000

The link plan with the largest total receives a vote.

Notes

Chapter 10: Scheduled events

Action lists can be scheduled at specified times on selected days and dates. An action list can contain most of the SCATS commands except those that display data. Action lists are maintained by the SCATS Central Manager. When a change is made to the master data in the SCATS Central Manager, a copy is sent to the SCATS Region and saved in the file **Sys\Sys.tc**.

Warning: From version 6.9.4, the maximum number of schedule entries is 500. Prior to this, it was 255. If the number of schedule entries exceeds 255, you cannot roll back to a version earlier than 6.9.4 without losing all your schedule entries. To avoid losing the lower numbered schedule entries, stop the SCATS Region that needs to be rolled back and open the **Sys.lx** filein a text editor. If the value of *x* in `DITC=x!` is greater than 255, then change it to 255. You can now roll back to the old version without losing schedule entries from 1 to 255.

The maximum schedule entry number is 64999. This should not be confused with the maximum number of schedule entries.

Listing schedule data

TC=*n***!**	Set the data entry/list pointer to schedule number *n*.
TC=*n***!L!**	Set the pointer and display schedule number *n*.
TC=*n***,L!**	List schedule number *n* without changing the pointer.
TC=*!L!	List all schedules – pointer set to last schedule.
TC=*,L!	List all schedules without changing the pointer.
TC?	List the schedule pointer.
TC*n***?**	List schedule number *n*.
TC#*n***?**	List all schedule numbers that use the action no. *n*.
TC=*n***!EN!**	Invoke auto prompt mode for data entry of all items in schedule number *n*.
TC*n***=!**	Clear schedule number *n*.
TCC=*string*	Puts comments on scheduled events. Exclamation marks are accepted. They will be saved as vertical bars in the **Sys.lx** file. Maximum length: 31 characters.
TCC?	List the comment.
TCV?	List vacant schedules.
TTC=*n***!**	Test the command syntax and list the commands in action list *n*. Note that you may still get an error even though the syntax is correct as the commands are not invoked. As an example, an action list may increase the number of split plans from 4 to 8. Reference to plans above four may be syntactically correct but will cause an `*ERROR-NUM*` as the site will still have 4 plans until the action list is read.
RTC=*n***!**	Interactive read of action list *n*. The maximum action list number is 64999.

Action list file format

The action list file is a text file. It is automatically created by the SCATS Central Manager. It can also be created using a text editor if there is no SCATS Central Manager. It contains action lists (groupings of SCATS commands), with each list identified by a number between 1 and 64999, immediately followed by a colon, e.g. `5:`.

Schedule format

TC*n***=***d********hh*:*mm*#*n*,*p***!**	Schedule number *n* will, on day *d* at time *hh*:*mm*, read action list *n*. Note that *n* must be within the range of 1 to 64999. *p* is an optional priority.

For example, to specify that schedule number 3 is to read action list 9 at 07:30 on Mondays (day 2) to Fridays (day 6), you would enter:

```
TC3=2-6*07:30#9!
```

Scheduled days

Schedules can be specified to read action lists on any combination of days. Sunday is day 1 and Saturday is day 7. Use a comma to separate the day numbers or use a dash between a range of days, e.g. `TC3=1,5-7!` operates on Sunday, Thursday, Friday and Saturday. Use 'S' to allow the schedule to operate on a special date.

Disabling a schedule

Precede the day number(s) with the letter `D` to disable a schedule, e.g. `TC3=D1,5-7!` is disabled.

Scheduler date control

The action list database may contain many action lists. Each action list is identified by a number between 1 and 64999. To differentiate an action list from SCATS commands, the action list number is left justified and is immediately followed by a colon, e.g. `3:`

The same number may appear more than once. However, once an action list number has been found, reading of the data stops when another action list number is encountered.

To allow more control when reading action lists, an action list number may be optionally followed by either a single date, or by a start and finish date. The date format must be *dd-mmm-yyyy* where *mmm* is alphabetic, e.g. `5-FEB-2009`.

An example of date control may be action list number eight that is scheduled to be actioned on Mondays to Fridays at 07:30 as in `TC5=2-6*07:30#8!` The action list may contain:

```
8: 19-JAN-2009
FTP3=1.4b,110!
8: 26-JAN-2009 30-JAN-2009
FTP3=1.4b,100!
8:
FTP3=2.4b,100!
```

The command `FTP3=1.4b,110!` will only be read on Monday, 19 January 2009 and the remaining two number 8 action lists will be ignored. Between Monday, 26 January 2009 and Friday 30 January 2009, `FTP3=1.4b,100!` will be the only command invoked. All other Mondays to Fridays not for the specified dates will use `FTP3=2.4b,100!`

Note that if there is an error in a date, the command group for TC group will be ignored. Action lists with dates must precede an action list of the same number without a date.

Comment records

An action list may contain comment records that start with a semicolon. These can be given their own line or you can use trailing commands after a command. Do not place a trailing comment after an action list number.

Example

```
1:
; Change cycle length for a.m. peak
SS=12!CL=130!
2:
PM2=4.4!SS=2!CL=110^!
123!PL=2!C=+PDNG!PL/SA33=4#!
```

An action list starts with a number followed by a colon and ends at the next action list number. Action lists can be numbered between 1 and 64999, and unused numbers can be omitted.

Note that each command must finish with a command terminator.

Use the equals (=) key and not the spacebar for an equals sign.

Tabs or spaces between commands are ignored.

Records beginning with a semi-colon are ignored (comment lines).

Errors encountered in an action list are logged.

Testing an action list

TTC=*n***!**	Tests the syntax of action list *n*, but does not invoke the data.

This command should be used to test each command in an action list when you have finished entering the data and before the commands are scheduled to be read.

Because the data is not invoked, you may get an `*ERROR-NUM*` or an `*ERROR-PTR*` such as using an action list to change a site from 4 split plans to 8 split plans and another action list to change it from 8 plans back to 4. If the site has 4 split plans, testing the action list that specifies 8 split plans will cause an error as the site only has 4 plans.

Listing sorted action lists

DTT!	Lists the sorted action lists scheduled for today.
DTT=*n***!**	Lists the sorted action list timetable data scheduled for day *n* where *n* is a value between 1 (Sunday) and 7 (Saturday). Note that this excludes any action lists that are date specific, e.g. `4: 1-JAN-2009`.
DTT=*dd-mmm-yyyy***!**	Lists the timetable for the specified date including those action lists whose data range covers the specified date, e.g. `DTT=1-JAN-2009!`

Alternate method of invoking action lists

Action lists may optionally be dynamically read by variation routine number 36. See Variation parameters for full details.

Manually invoking action lists

Action lists may be manually invoked with the `RTC` command, e.g. `RTC=7!` invokes action list 7.

Notes

Chapter 11: Listing combinations of data

Item numbers

A command of *pointer*!*item*? will return all the item numbers that belong to the pointer entered. These commands work for most combinations of sites, slots, subsystems, strategic inputs, strategic approaches and links. For example:

SS=*n*!I?	List all sites in subsystem *n*.
SS=*!I?	List all sites on the region.
SS=*n*!SI?	List all strategic input numbers in subsystem *n*. Similarly, SS=*n*!SA? for strategic approaches etc.
SI=*n*!SA?	List all strategic approach numbers using strategic input *n*.

Combinations that go backwards will not work, as in SA=*n*!SI? and LK=*n*!SI?, as in these examples, strategic approaches and links are not used by strategic inputs.

Data listing

A command of *pointer*!*item*,L! will list data for all items that belong to the pointer entered. This command differs from the above commands in that it lists all data for the specified items instead of just the item numbers. For example:

SS=*n*!SA,L!	List all strategic approach data in subsystem *n*.
SS=*n*!I,L!	List site and plan data for all sites in subsystem *n*.
***n*!SI,L!**	List all strategic input data for site *n*.

Listing unused data items

LKV?	List vacant link numbers.
SAV?	List vacant strategic approach numbers.
SIV?	List vacant strategic input numbers.
SLV?	List vacant slot numbers.
SSV?	List vacant subsystem numbers.
TCV?	List vacant schedules.

The general list format for these commands shows each unused item number plus the total free item in brackets.

Example

SLV?

```
20 45 61 (3)
```

Listing data for groups of items

I=*!LM?	List the link mode for all sites.
SS=*!LM?	List the link mode for sites in all subsystems.
I=*!CID?	List the controller type for all sites.
SS=*!CID?	List the controller type for sites in all subsystems.
I=*!XID?	List the controller type plus external device ID (e.g. ANTTS interrogators or lamp monitoring units) for all sites (subject to VC).
SS=*!XID?	As above for sites in all subsystems.
I=*!CE?	List details of communications alarms for all sites with a communications error (CE) alarm.
I=*!BD?	List bad data (BD) alarms at all sites.

Chapter 12: SCATS data limits

Region data limits

Item	Min.	Max.	Remarks
DISL	1	250	Slots
DISS	1	250	Subsystems
DISA	1	900	Strategic approaches
DISI	1	900	Strategic inputs
DILK	1	500	Links
DITC	1	500	Schedule entries (**Warning:** This was increased from 255 to 500 in version 6.9.4. If DITC is greater than 255, then you cannot roll back to an earlier version without losing all your schedule entries.)

Site data limits

Item	Min.	Max.	Remarks
AT to **GT**	0	63	Phase intergreen. This can be followed by 'S' for Z5 facility, e.g. BT=5S!
BPS			
COM			
CS	0	255	Checksum
CTYPE			
DCL	0	200	Double cycling threshold
IK			Site options
INT	0	64999	Site identification number INT=0! special used as in intermediate step when changing a site number.
LM			M, F or I (can include ^)
PK			Parks and unparks alarms
PP*n*	–127	+127	Offset values for PP*n* a, b.
RMN	0	200	Cycle length for low demand control
SLOT*n*	0	DISL	*n*=slot number
phases	2	7	Number of phases, e.g. SLOT22=4,8,3! for 4 phases
plans	1	16	Number of split plans, e.g. SLOT22=4,8,3! for 8 plans (can only enter 1, 4, 8 or 16 for plans)
walks	0	8	Number of pedestrian movements, e.g. SLOT22=4,8,3! for 3 pedestrian movements
S#	0	250	Subsystem number
VC	0	7	Controller mode value
VOLS	0	48	
			y is parameter value between 0 and 65535
W*n*	–127	127	Length of walk for pedestrian movement *n*
W*n*T	0	100	Length of clearance for pedestrian movement *n* (even values only)

Split plan limits

Item	Min.	Max.	Remarks
A to **G**	0	80	Percentage split
	1#	47#	Real-time seconds
I			
PLAN	1	16	1, 4, 8 or 16 plans
SF			Special facilities Y-, Z-, Z+, DC
XSF	32*	32*	Extra special facilities (*XSF flags 17 to 32 can only be sent to VC6.1 controllers)

Subsystem limits

Item	Min.	Max.	Units	Description
HCL	20	240	seconds	Maximum cycle length
KCL	0	240	seconds	Plan selection minimum cycle length
LCL	20	100	seconds	Minimum cycle length
LP*n*=*a*,*b*^*cd*X!				'^' indicates start of phase. If omitted, it indicates end of phase.
n	1	4	–	Link plan number
a*,*b	–127	+127	seconds	Offsets (*= no marriage)
^				
c	A	G	–	Phase
d	1	64999	–	Site
X			–	External marriage indicator
PS*n*=*a*,*b*!			–	
***n*:**	1	4	–	PS for plan *n*
***a*,*b*:**	0	200	seconds	PS cycle lengths (the first value can include ^)
SCL1	20*	150	seconds	Alternate minimum cycle length 1
SCL2	20*	150	seconds	Alternate minimum cycle length 2
SS	1	DISS	–	Subsystem pointer
SZ1	70	100	%	Calibration factor for stretch cycle length
SZ2	70	120	%	Calibration factor for maximum cycle length
XCL	20*	240	seconds	Stretch cycle length
FCL				
SK				Subsystem options

* indicates that a value of 0 can be specified if this feature is not to be used

Strategic approach limits

Item	Min.	Max.	Limits
SA*n*	1	DISA	*n* is the strategic approach pointer
SD	0	15	Green-time percentage
SD	0	127	Plan bias factor (volume votes) can include '^'
subsystem	0	250	e.g. SA28=3! for subsystem 3 can include '#' and '^'
S^	1	DISI	Strategic input number
VF=*a*,*b*			
a	0	31	Minimum cycle length/alternate minimum cycle length control
b	0	127	Alternate minimum 1 cycle length/alternate minimum 2 cycle length control
VK	0	200	Calibration factor (0=100) can include '^'

Strategic input limits

Item	Min.	Max.	Limits
AV	0	32767	Average daily volume (Monday to Friday)
D#	0	24	Detector numbers – maximum of 4 per strategic input
KP	0	255	Average occupancy
MF	720	2408?	Maximum flow (Monday to Friday)
NF	0	255	Calibration factor (0 = 100)
SI*n*=*m*!			
n	1	900	Strategic input *n*
m	1	64999	Site

Link limits

Item	Min.	Max.	Limits
DB	0	127	Link plan directional bias factor
LKn	1	500	Link pointer *n*
LQ	–126	3000	Link queue value for marriage
L^	1	900	Strategic input number used by the link for data
subsystem	0	250	e.g. LK7=2! for subsystem 2
VB	0	255	Link calibration factor (0 = 100)

Schedule limits

Item	Min.	Max.	Limits
TC*n*	1	255	TC pointer *n*
day	1	7	Day codes 1–7 = Sunday–Saturday respectively
time	00:00	23:59	24-hour time
record	1	64999	Action list number
TCC			Comment (string, limited length)

Notes

Chapter 13: Miscellaneous commands

Controller type

CID? List version number of controller software.

The response from the controller is of the form C*x*V*y*R*z* where:

x is the controller type:

1 = AWA Delta-2
2 = Harding Signals PC 200 (a.k.a. Acorn)
3 = Philips PSF-3
4 = Philips PSF-4
5 = Philips PTF
6 = Philips PTF-VC6
7 = AWA Delta-3
8 = AWA Delta-2.5
9 = Philips PTF-3
10 = Philips PSF with memory card
11 = Philips PSF for Victoria
12 = Philips PSC 2000
13 = AWA Delta-4
14 = AWA Delta-5
15 = Philips PSL
16 = PCTRAFF or WinTraff controller emulator
17 = Caltrans model 170
18 = Quick Turn Circuits Epsilom
19 = Aldridge Traffic Systems AB
20 = Plessey SCATMO
21 = Lane controller (various manufacturers, various types)
22 = Tyco Delta-5P (re-badged PSC 2000)
23 = Tyco SCATS Outstation Transmission Unit (SOTU)
24 = Tyco Eclipse
25 = Harding Signals SID
26 = Caltrans model 2070 – M52 hardware version
27 = Caltrans model 2070
29 = Aldridge Traffic Systems ATSC4
30 = Tyco Beacon
35 = SCOPE SIU
36 = Siemens SITRAFFIC sX
37 = SWARCO ITC-2
38 = SWARCO ITC-3

y is the software version number

z is the software release level

Multiple requests

I=*!CID? Shows controller ID for all sites in the monitored region.

SS=*!CID? Shows controller ID for sites in all subsystems in the monitored region except subsystem zero.

External device type

XID? As for CID? but also lists information for any external devices such as a lamp monitoring unit (LMU) or an Automatic Network Travel Time System (ANTTS) interrogator.

Example

`XID?`

```
413:C9V2R2S0 L1R3 VB7FR2 P12345
```

where:

`413` is site 413

`C9V2R2S0` is PTF3 controller running version 2 release 2 software from supplier 0 (Philips)

`L1R3` indicates lamp monitoring unit (LMU)

`VB7FR2` indicates ANTTS tag

`P12345` is the site from the personality (needs latest controller software)

`I=*!XID?` Displays XID data for all sites.

`SS=*!XID?` Displays XID data for sites in all subsystems except subsystem zero.

Lamp commands

Setting/listing lamp status

The following commands are used to remotely switch lamps at a site to:

- off
- flashing yellow
- on

`LS=OFF!` Informs the site to turn its lamps off (even if currently flashing yellow) [`LS=OF!` is acceptable].

`LS=FY!` Informs the site to display flashing yellow (even though the lamps may be off).

`LS=ON!` Informs the site to switch its lamps on – the lamps can also be turned on from the controller by activating the alarm cancel switch for 10 seconds.

`LS?` List the active lamp status/desired lamp status for the monitored site, e.g. `LS? BO/ON` or `??/ON` if site is not communicating.

`I=*!LS=ON!` Turn on lamps at all sites.

`I=*!LS=OFF!` Turn off lamps at all sites.

`SS=`*n*`!LS=ON!`** Turn on lamps at all sites in subsystem *n*.

`SS=`*n*`!LS=OFF!`** Turn off lamps at all sites in subsystem *n*.

`SS=*!LS=ON!` Turn on lamps at sites in all subsystems.

`SS=*!LS=OFF!` Turn off lamps at sites in all subsystems.

`*ERROR-BSY*` will occur if an attempt is made to:

- switch the lamps on or off at a site running:
  - police off
  - police manual
  - police red
- dwell a site running:
  - maintenance interrupt mode
  - hurry call

Lamp dimming

LD? List lamp dimming level (0,1,2) at the monitored site – 0=none.

LD1! Set lamps to dimming level number 1.

LD2! Set lamps to dimming level number 2.

LD/ Disable lamp dimming.

Lamp faults

SCATS Region logs lamp faults by:

- signal group number
- colour
- number of lamp faults

A lamp fault record is logged when a site first gets a lamp fault alarm. If a site has a lamp fault, it is polled each hour for new faults. Data is logged for the first 10 signal groups that have a lamp fault.

LA! List all sites that have lamp fault alarms.

LF? List lamp faults at the monitored site, e.g. `LF? 5:1R2G` shows signal group number 5 has 1 red lamp, and 2 green lamps out.

Lamp wattage

LW*n*? List the current lamp wattage/normal lamp wattage for each colour of signal group number *n*.

Example

LW5?

```
R:255/400 Y:0/0 G:220/460
```

This shows that on signal group 5 the red lamps are currently using 255 watts but normally consume 400 watts, there are no yellow lamps for this group, and the green lamps are currently using 220 watts but normally consume 460.

If LF? for this site shows 1R2G, then by deduction, there are probably 2 red lamps left, and 2 green lamps.

Lamp voltage

LV? List the lamp voltage and the mains voltage.

Example

LV?

```
L243,M244
```

Dial-up sites

DD=*list*! Days to dial, e.g. `DD=1-7!` where 1=Sunday.

SCATS Region data dump

LX! List all SCATS Region data directly from the computer memory in command line format.

Pedestrian features

PPB=1,2! Place demands for walk 1 and 2 etc.

PE? Shows all pedestrian demands and the status of walks, e.g. `PE?PDEM1,2PWLK4.` shows a demand for walks 1 and 2 and walk 4 is running.

Controller RAM update

UD! Update controller RAM and clock – clock will not be updated if subsystem is on fallback (unless the RC site option is on) or if region has a TIM alarm.

UD/ It clears the controller RAM. Then sends the defined RAM items, Flexilink plans and schedules to controller. This is the only way to clear any erroneous data entries in controller RAM.

RC! Resets the controller clock. This is intended to overcome the restriction where the clock is not reset if the site is on fallback and the RC site option is off. If the site belongs to a subsystem and the subsystem is on fallback, you will be asked for confirmation, otherwise there is no confirmation. The new date and time is sent at the next whole minute.

Miscellaneous

CE? List cause of a communication error at the monitored site. Use `I=*!CE?` to list all CE alarms on the region.

DRST=0x*nnnn***!** Resets V2.x version of a DIDO unit. *nnnn* is the hexadecimal ID of the DIDO unit that is to be reset. An access level 5 is required. `DRST?` lists the sites that have resets pending.

MC? List controller clock time in format `3*11:44.22` where 3 is the day code (1 to 7, where 1 = Sunday, 2 = Monday etc.) and `11:44.22` shows hours, minutes and seconds.

RSD=*n***!** Resets controller detector. This command is for VC5 and higher controllers only. Other controller types return `*ERROR-ILL*`.

SPA? List the average space for the region. This value is calculated at midnight Monday to Friday from all good lanes in all strategic inputs for the region and is used in the estimated maximum flow calculation (default = 100 centiseconds).

UF? Lists the fallback timer for the current subsystem pointer (SS=*n*!). The value is displayed in minutes.

A 0 result shows the fallback pending/fallback active timer is inactive (normal condition).

A positive value shows fallback is active for the displayed number of minutes.

A negative value shows that fallback is pending. A repeat of an alarm before the timer reaches zero will send the subsystem to fallback.

UP? List the date and time when SCATS Region was last started.

VD? Detector status. Lists occupied vehicle detectors.

ZD! Zero all RAM data on disk of the monitored site. This command does not zero the RAM data in the controller. To do this, follow `ZD!` with `UD!`

Extra special facilities

Extra special facility (XSF) flags can be sent to a site to control special features. Such features must be programmed into the site's personality. Each split plan has its own set of XSF flags.

Note: SCATS Region uses XSF flags 1 to 16 (prior to version 6.8.3.1) or 1 to 32 (from version 6.8.3.1), but the controller uses XSF bits 0 to 15 (prior to VC6) or 0 to 31 (from VC6.1). Be careful not to get these confused. You must subtract 1 from the SCATS XSF flag to determine the XSF bit used in the controller.

XSF flags can be specified with:

XSF=1,3,5!	Sets flags 1, 3 and 5. All other flags are cleared.
XSF=1-3!	As above, but for 1 to 3 inclusive.
XSF/	Clear all extra special facility flags.
XSF=+4!	Set extra special facility flag 4. Do not change any other flags.
XSF=-2!	Clear extra special facility flag 2. Do not change any other flags.
XSF=-2,+16!	Clear extra special facility flag 2. Set extra special facility flag 16. Do not change any other flags.
XSF?	List the XSF flags that are currently set at the current site, e.g. `XSF? 246:1,3-6` lists the XSF flags that are currently on for site 246.
I=*!XSF?	List the XSF flags that are currently set at every site in the region.

Note: See also XSF flag locks and trims.

Fixed-time operation

If the FT region option is set, SCATS Region will automatically send XSF flag 4 to any site whose subsystem has a fixed-time plan enabled and will clear XSF flag 4 if a fixed-time plan is not enabled. XSF flag 4 is used in Hong Kong to call and extend phases at sites with no detectors.

Remote special facilities

Remote special facility (RSF) flags are general purpose flags that can be set or cleared and tested by variation routines to allow the SCATS Region to modify site operation or implement special features. The difference between RSF flags and XSF flags is that:

- RSF flags are not sent to the controller.
- RSF flags can be set or cleared for a site in a different region.

SCATS Region version 6.8.3.1 introduced a number of enhancements to RSF flags. The differences between the old and new versions are listed below.

Any version of SCATS Region less than 6.8.3.1 has the following restrictions:

- Each site has 16 RSF flags numbered 1 to 16.
- Individual RSF flags cannot be set or cleared from a command-line interface, graphical user interface or action list.
- All RSF flags for the monitored site can be cleared via a command-line interface or graphical user interface.
- All RSF flags for a specified site can be cleared via an action list.
- Individual RSF flags 1 to 16 can be set or cleared using variation routine 46. The site may be in the same region or in a different region.
- RSF flags 1 to 16 can be tested using variation routine 81. The site must be in the same region. You cannot test RSF flags at a site in a different region.

Any version of SCATS Region greater than or equal to 6.8.3.1 has the following restrictions:

- Each site has 32 RSF flags numbered 1 to 32.
- Individual RSF flags can be set or cleared from a command-line interface, graphical user interface or action list by applying a lock or trim.
- All RSF flags for the monitored site can be cleared via a command-line interface or graphical user interface, providing the flags are not locked or trimmed.
- All RSF flags for a specified site can be cleared via an action list, providing the flags are not locked or trimmed.
- Individual RSF flags 1 to 31 can be set or cleared using variation routine 46. RSF flag 32 cannot be changed. The site may be in the same region or a different region.

- RSF flags 1 to 16 can be tested using variation routine 81. RSF flags 17 to 32 cannot be tested. The site must be in the same region. You cannot test RSF flags at a site in a different region.

The following commands are used to list and clear RSF flags. These work with any version of SCATS Region.

RSF?	Lists the RSF flags that are on at the monitored site.
I=*!RSF?	Lists the RSF flags that are on for all sites in the monitored region.
RSF/	Clears the RSF flags applied by VR46, unless they are locked or trimmed.

Example

RSF?

```
77:1,4
```

This indicates that RSF flags 1 and 4 are on at site 77.

Note: See also RSF flag locks and trims.

Miscellaneous status flags

Miscellaneous status (MSS) flags are sent from a controller to a SCATS Region. A variation routine can test the state of an MSS flag and invoke special features.

Note: SCATS uses MSS flags 1 to 16 (prior to version 6.8.3.1) or 1 to 32 (from version 6.8.3.1), but the controller uses MSS bits 0 to 15 (prior to VC6) or 0 to 31 (from VC6.1). Be careful not to get these confused. You must subtract 1 from the SCATS MSS flag to determine the MSS bit used at the controller.

MSS?	Lists the MSS flags.
MSF?	Displays the reserved XSF/MSS flags 1 to 3 for comparison. These are read from left to right, i.e. flag 1, 2 and 3 in that order.

Example

MSF?

```
110,100
```

This shows that XSF flags 1 and 2 are on, XSF flag 3 is off, MSS flag 1 is on and MSS flags 2 and 3 are off.

Low degree of saturation operation

SCATS Region normally uses the equisat method for proportioning phase splits. Under light traffic conditions, no differentiation is made between the importance of each approach, hence the approach with the highest degree of saturation generally receives an increase in green time.

When all degrees of saturation drop below about 70%, it is debatable whether the relative differences in degrees of saturation on each measured approach warrant the same treatment. In an effort to prevent minor phases from receiving more green just because their degree of saturation is higher than the main road (even though the highest degree of saturation may only be 20%), an alternative method of proportioning phase splits is available. This is set using the LD subsystem option, e.g. SK=+LD!

When the LD subsystem option is set, low degree of saturation operation is enabled. In this case, only the stretch phase receives an increase in phase splits when the degree of saturation drops below a predefined threshold. This operation is maintained until the degree of saturation rises above another predefined threshold. The two thresholds are defined using the LDS command.

LDS=*m*,*n*! Specifies the low degree of saturation operation thresholds, where:

m is the low degree of saturation threshold, expressed as a percentage (minimum = 60, default = 70)

n is the high degree of saturation threshold, expressed as a percentage (maximum = 90, default = 80)

The low threshold must be less than or equal to the high threshold. These thresholds are applied to the whole region.

LDS? Lists the low degree of saturation operation thresholds.

Sending messages to another workstation

"*n**message*** Sends the string *message* (maximum 61 characters including the *n*) to device *n*.

"* *message*** Sends message to all terminals connected to the region.

"0*message*** Sends message to the event log. Messages from device 0 come from disk.

When a message is received, it is shown using the following format:

```
<nmessage
```

Messages from device 0 come from an action list.

Listing workstation numbers

WHO? Lists the status and type of all active terminals on the region.

Terminal status

The WHO? command lists data in the following format:

```
TIn=PC1: [CRT] - [OWN] - MONITORING INT y KEY 22:3
```

where:

TI*n* is terminal number *n* (The *n* can be used when sending a message to another workstation with the "*n* command).

PC1 is the terminal driver type, where:

PC means the driver supports PC workstations

DZ indicates field terminal

[OWN] is your own terminal

MONITORING INT *n* means this terminal is monitoring site *n*.

FROM INT *y* means this is a field terminal connected to site *y*.

KEY 22:3 means SCATS Region user 22 is logged on with access level 3.

(DIALUP) means the terminal is using the dial-up site facility for monitoring (i.e. the CON! command).

Intelligent Transport Systems

SCATS Region can supply information to or receive information from external applications, referred to as Intelligent Transport Systems (ITS) applications. ITS applications need to be licenced to connect to SCATS. The names of the ITS applications permitted to connect to SCATS Region have to be defined with the SCATS Region Configuration program (prior to SCATS version 6.5.1) or SCATS Access (from version 6.5.1).

ITS? List the current ITS connections.

Site messages

Each site has two 72-character message associated with it. The identifier for message one is M1. The identifier for message two is M2, e.g. M1*xxxx* or M2*xxxx*.

M1 and M2 should be used in place of the old identifiers, where single quote and two single quotes are used to access the first and second site message respectively.

Site message commands

Note: In the following commands, *n* is 1 or 2 for message 1 and 2 respectively.

M*n**string*	Replace message *n* with the new message *string*.
M*n***!**	Delete message *n*.
M*n***?**	List message *n*.
M*n***^B/***string/*	Add *string* to the beginning of message *n* if it is not already in the message.
M*n***^D/***string/*	Delete *string* from message *n* if it is in the message.
M*n***^E/***string/*	Add *string* to the end of message *n* if it is not already in the message.
M*n***^S/***string1/string2/*	Replace *string1* with *string2* in message *n*.
M*n***^S/***string.../string2/*	Replace *string1* and everything after it with *string1* in message *n*.
M*n***^S/...***string/string2/*	Replace everything up to and including *string1* with *string2* in message *n*.
M*n***^S//***string/*	Add *string* to the beginning of message *n*.
M*n***^S/***string//*	Delete *string* from message *n*.

The slash (/) character above is a delimiter. Any non-alphabetic character may be used as a delimiter, so if the slash character is part of the string, use another non-alphabetic character such as a backslash (\) or semicolon (;) that is not in the string as the delimiter.

The ^B, ^D and ^E formats of the command should be used in place of the ^S format when used in action lists for the following reasons:

- If the command M1^S/string// is used to delete a string from the existing message and the string does not exist, an *ERROR-CMP* message is written to the event log every time the action list runs. This does not occur with the M1^D/string/ command, because this only deletes the string if it is already in the message.
- If the command M1^S//string/ is used to add a string to the beginning of the existing message, it is added every time the action list is run, so the message gradually grows in length. If the message exceeds 72 characters, it is truncated, so the original message is eventually lost. For example, if the original message is '1234567890' and the command M1^S//ABCDEFGHIJKLMNOPQRSTUVWXYZ/ is in an action list, the message will change as follows:

  0123456789

  ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789

  ABCDEFGHIJKLMNOPQRSTUVWXYZABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789

  ABCDEFGHIJKLMNOPQRSTUVWXYZABCDEFGHIJKLMNOPQRSTUVWXYZABCDEFGHIJKLMNOPQRST

Listing all site messages

MSG? List all messages for the monitored region. Each message is preceded by its site number.

Message file format

The site message file **Sys.msg**, contains two 72-byte fixed-length records for each slot. The record does not include the slot number or the site number. The file is accessed by using the slot number to retrieve the corresponding records from the file.

For example:

- If monitoring the site in slot 23, the 45th record will be displayed on the message line of the workstation if a message exists (i.e. not all nulls). If using SCATS Access, both messages (45th and 46th record) will be shown.
- If using the MSG? command, all records on the file will be displayed. Each record will be preceded by its site number. The site number will be followed by a period for the first message and a colon for the second message, i.e.

MSG?

```
3456. this is the first message for site 3456
3456: this is the second message for site 3456
```

This file should never be edited. It will change the file characteristics, causing corrupted messages.

User-defined site alarms

User-defined site alarms are generated by a SCATS Region as a result of either:

- an ALM command entered using a command line interface (such as SCATS Terminal or SCATS Region running as a console application)
- an ALM command applied by an action list
- an event log request from an ITS application to turn the alarm on or off

If the user-defined site alarm is generated by an ALM command, the syntax is:

ALM+*m*.*n*=*string* (to turn alarm on)
ALM-*m*.*n*[=*string*] (to turn alarm off)

where:

m = site (1–64999)
n = alarm number (1–10)
string = alarm details (up to 100 ASCII characters)

Alarm numbers 1–10 in the ALM command correspond to types 80–89 in the alarm identifier stored in the SCATS Central Manager database.

User-defined site status

User-defined site status is generated by a SCATS Region as a result of either:

- a STAT command entered using a command line interface (such as SCATS Terminal or SCATS Region running as a console application)
- a STAT command applied by an action list
- an event log request from an ITS application to turn the status on or off

If the user-defined site status is generated by a STAT command, the syntax is:

STAT+*m*.*n*=*string* (to turn status on)
STAT-*m*.*n*[=*string*] (to turn status off)

where:

m = site (1–64999)
n = status number (1–10)
string = status details (up to 100 ASCII characters)

Status numbers 1–10 in the STAT command correspond to types 90–99 in the alarm identifier stored in the SCATS Central Manager database.

Notes

Chapter 14: Monitoring a site

Basic site monitoring

Communications messages

M! Enables message monitoring in lines 3 and 4 of SCATS Terminal.

Messages from the SCATS Region to the controller are shown in line 3 and are preceded by TX.

```
TX <32 <256 56 <250 311 0
```

Messages received from the controller are shown in line 4 and are preceded by RX.

```
RX >220 223 >232 16 300 >56 30 0
```

M/ Restores the normal display.

MR! command

By entering MR! the day and time at the controller is shown on line 10:

```
6*10:15:32
```

where:

6* is the day number (1–7 = Sunday to Saturday respectively)

10:15:32 is the time (24-hour clock)

Exit with MR/.

If a site is running Flexilink and there seems to be a fault in offsets between this site and others (assuming plan data and offsets are correct) use MR! (or MC? on a printer terminal) to obtain the time in the controller.

TIM? Show the time at the regional computer. You can use this in conjunction with the MR! command to compare the two times to detect any error in the controller time.

UD! Update the controller clock time to that of the regional computer. Note that SCATS Region normally updates each site clock each whole ten minutes.

The site clock will be updated if:

- it still communicating with the regional computer (i.e. does not have an ST, PF, WD or OD alarm)
- the subsystem to which the site belongs does not have its fallback flag set nor have fallback pending

Setting the region time will update the clock at all controllers subject to the conditions above.

Memory contents

MR! MR! also enables the display of memory location from a controller. If after entering MR! the Flexilink plan and cycle generator step is displayed on the monitor line.

FX/ Restore the memory location data display.

A memory location is accessed by specifying a display format code, followed by a page number and an offset, separated by a semi-colon. For example, MD4;52 where 4 is page number 4 and 52 is the 53rd byte (the first byte is byte number 0).

The format codes are:

MD*p*;*b*! Memory display in decimal, e.g. MD4;301!

MY*p*;*b*! Memory display in octal, e.g. MY2;77!

MH*p*;*b*! Memory display in hexadecimal, e.g. MHB;A0!

Note: The character after the value displayed indicates its base as follows:

.	Decimal
#	Octal
$	Hexadecimal

Flexilink plan and cycle generator step

MR! Also allows access to the dynamic Flexilink plan and cycle generator display from a controller. If controller memory contents are currently displayed in the centre of the monitor line, enter FX!. Use FX? to list this information on a printer terminal. FX/ restores the memory contents listing.

Timers

The approach timer display is also shown on the right of the monitor line. All approach timers operate without regard to operating mode. As each timer expires, it is displayed, until reset, as follows:

1GHW2GHW3GHW4GHWMXTR

where:

1-4 is the approach timer number

G means the gap timer for the preceding approach number has expired

H means the headway timer for the preceding approach number has expired

W means the waste timer for the preceding approach number has expired

MX means the maximum timer has expired

TR means maximum time transfer is running

See RTA-TC-106 *Traffic signal operation* for a description of the operation of the various timers.

MT? Obtain timer data

Site diagnostic monitor

Site diagnostic monitor file name

Tracing site alarms can be very time consuming. SCATS Region allows detailed operational data for up to 64 sites per region to be automatically collected and viewed at a later time. Data is saved in an ASCII text file **ScatsData\Idm*n_yyyymmdd*.idm** where:

n is the site

yyyy is the year

mm is the month

dd is the day

Site diagnostic monitor commands

Site diagnostic monitor data can be collected on a region using the following commands.

IDM=*n*! Start a site diagnostic monitor collection for site *n*. *ERROR-BSY* indicates that all available IDM collections are in use.

IDM=*n*/ Stop a site diagnostic monitor collection for site *n*. *ERROR-NUM* indicates the site is not in the monitored region or is not currently being collected.

IDM? List the sites for which a diagnostic monitor has been specified.

The start and stop commands can be scheduled from an action list.

Viewing site diagnostic monitor data

Use a text editor such as Notepad to view a site diagnostic monitor file. The file is divided into records. Each record takes one line.

There are two types of records:

- timestamp record
- phase record

These are formatted as described below.

As a general rule, there is one timestamp record for each cycle followed by one phase record for each phase that ran within that cycle.

Timestamp record

A timestamp record is added in the following circumstances:

- The first timestamp is written when the data collection starts. This will most likely be followed by a partial phase record for the end of the phase that was running at the time the collection started.
- Subsequent timestamp records are written at the start of the stretch phase if running Masterlink or at the start of A phase if not running Masterlink. If the stretch phase and A phase are both skipped, then there will be no timestamp record for that cycle.
- The last timestamp is written when the data collection stops. This will most likely be preceded by a partial phase record for the start of the phase that was running at the time the collection stopped.

The timestamp record is formatted as follows:

dd-*mmm*-*yyyy hh*:*mm*:*ss nnnnn* **IP***a*.*b*. *lr mode alarms* **CL***c*

where:

dd is the day (00–31)

mmm is the three-character month (JAN, FEB etc.)

yyyy is the year

hh is the hour using 24-hour format (00–23)

mm is the minute (00–59)

ss is the second (00–59)

nnnnn is the site, right-justified with leading blanks, if necessary

a is the split plan, followed by a hash (#) if the plan is locked or a period (.) if not locked

b is the offset plan, followed by a hash (#) if the plan is locked or a period (.) if not locked

lr is **LR** if the lamps have been released due to a blackout or flashing yellow or blank otherwise

mode is the operating mode, i.e. **ISOL** for isolated, **FLEXI** for Flexilink, **HCALL** for hurry call, **POL O** for police off, **POL M** for police manual, **POL R** for police red, **MAINT** for maintenance mode, **Y-Z+Z-** for Masterlink. In the latter case, the **Y-**, **Z+** and **Z-** indicate that the respective special facility flag is on and blank means it is off. Therefore, this field will be blank if all special facility flags are off.

alarms is a list of site alarms. This will be blank if there are no alarms. Note that only blackout, flashing yellow, no carrier, parked, stopped talking and watchdog alarms (BO, FY, NC, PK, ST and WD respectively) are shown if the site is in maintenance mode and the MM region option is on.

c is the cycle length, preceded by a hash (#) if the cycle length is locked or an F if the cycle length is from a fixed-time plan (Masterlink only and the site has a subsystem). If married, **+***n* or **-***n* is appended to the cycle length to indicate the amount of rotation, where *n* is the rotation in seconds.

Phase record

A phase record is added at the start of each phase and updated as the phase status changes. Each phase record starts with the phase (A to G), followed by two spaces. This is followed by a number of phase status codes using the format:

code@*time*

where:

code is one of the codes from the following table

time is the time at which the change occurred expressed in seconds as a duration from the start of the phase

Code	Meaning
<>	Stretch phase
<I>	Stretch phase in Master-Isolated mode
SL	Slave site
TG	Time gain
FG	False green
W'	Walk 1 terminated (for controllers earlier than VC4)
W"	Walk 2 terminated (for controllers earlier than VC4)
W*n*	Walk *n* terminated, where *n* is 1 to 8 (for VC4 controllers or later)
XT	Extra time (RMN late demand operation is active)
MX	Phase call sent (Masterlink only) or controller's maximum timer has expired (isolated only)
TR	Controller's maximum time transfer is running (isolated only)
DW>*p*	Moving to *p* phase due to a dwell. *p* phase may be the dwelled phase or a non-skip phase.
DW^	Dwelling on the current phase
RT:*timers*	Request to terminate received from controller. *timers* indicates the state of the gap, waste and headway timers.
P^*p*	Controller has acknowledged a phase call and is moving to *p* phase
Z5	Z5 flag set to prevent introduction of a signal group minimum timer
R/Y	Red/yellow interval
LST	Late start interval
MIN	Minimum green interval
VIG	Variable initial green interval
GRN	Rest or extension green interval
ECG	Early cut-off green interval
YEL	Yellow interval
RED	All-red interval
***n*GHW**	Phase gapped off (see below)

If multiple changes occur at the same time, these are concatenated, e.g. W3MX@19. In some cases, a colon is used to separate the multiple changes to aid in legibility, e.g. P^A:YEL@21.

If a phase gaps off, the state of the approach timers is shown using the format 1GHW2GHW3GHW4GHW, where a number indicates the approach timer number, G indicates the gap timer has expired, H indicates the

headway timer has expired and `W` indicates the waste timer has expired. Only those timers that have expired are shown and only for those approaches that have expired timers, e.g. `2G3W:RED@41`.

At the end of the phase, the following information is added to the end of the phase record:

`MX`*n* Remaining phase time (Masterlink only)

`AL`*n* Remaining clearance alarm-time

`CG`*n* Cycle generator step (Masterlink only and the site is in a subsystem). If the subsystem is married to a subsystem in another region, the cycle generator step is followed by **`>X`**, e.g. `CG99>X`. If the subsystem is married to a subsystem in the same region, the cycle generator step is followed by **`>`***n*, where *n* is the cycle generator step of the other subsystem, e.g. `CG99>22`.

`PT`*n* Phase length

Note: If the phase is particularly long because of a dwell or an absence of demands for other phases, then the phase appears to terminate and the record is closed after 250 seconds. This is indicated by `PT250`. You can confirm that this has happened by comparing the sum of the phase times with the difference between the surrounding timestamps. In this case, no further phase status is written until the next phase starts.

Example

```
A  <>MIN@1 GRN@5 W3@10 MX@92 YEL:P^C@93 RED@95 MX0 AL0 CG71 PT99
```

where:

`A` means A phase

`<>` means this is the stretch phase

`MIN@1` means the phase started in the minimum green interval

`GRN@5` means the phase moved into the extension green interval at 5 seconds

`W3@10` means the walk 3 termination message was sent at 10 seconds (on controllers less than VC4, `W'` and `W"` will be shown instead of `W1` and `W2`)

`MX@92` means the maximum signal was sent at 92 seconds

`YEL:P^B@93` means the phase moved into the yellow interval and the controller commenced the move to B phase at 93 seconds

`RED@95` means the phase moved into the all-red interval at 95 seconds

`MX0` means the unused phase length was zero

`AL0` means the clearance alarm-timer was zero

`CG71` means the cycle generator step was 71 at end of phase. (We can also tell that the subsystem was not married, as the marriage information was not appended.)

`PT99` means the phase length was 99 seconds

Critical sites

You must nominate the same critical site in all approaches that can control split plan selection in a subsystem.

As a result, the command `CI?` will list the critical site for the subsystem of the monitored site.

Use `I=*!CI?` to list the critical sites for all subsystems.

Listing plans

`IP?` Lists the split and offset plan numbers currently operating at the monitored site.

`SP?` Lists the split and link plan numbers currently selected by the subsystem.

Monitoring a subsystem

Traffic information relevant to the performance of a subsystem can be monitored with a strategic monitor.

Strategic monitor commands

SM! Immediate display of strategic monitor for subsystem of monitored site.

SM*n*! Immediate display of strategic monitor for subsystem *n*.

SMR! Immediate plus repeating strategic monitor for subsystem of monitored site.

SM*n*R! Immediate strategic monitor for subsystem *n*, plus repeat strategic monitor each cycle.

SMR/ Cancel repeating strategic monitor for subsystem of monitored site.

SM*n*R/ Cancel repeating strategic monitor for subsystem *n*.

SMR? List subsystems with repeating strategic monitors.

SM? List strategic monitor modes currently set up.

SM*! Sets strategic monitor mode to HD (e.g. SM=HD!), then gives strategic monitor header for all subsystems.

Strategic monitor data

The operating phase splits at the critical site in a subsystem are displayed at the end of a strategic monitor for non-incremental split selection subsystems. This can be done because all strategic approaches in a subsystem must now point to the critical site of the subsystem to which they belong.

Strategic monitor modes

Volumes for strategic approaches

Any one of the following modes may be specified for volume display. If the optional link data is included in a strategic monitor, the volume type displayed for each link will be the same as specified for the strategic approaches.

SM=VO! Volume original

SM=CVO! Volume original per hour of cycle length

SM=GVO! Volume original per hour of green time

SM=VK! Reconstituted volume

SM=VOVK! Volume original / volume reconstituted

SM=CVK! Volume reconstituted per hour of cycle length

SM=GVK! Volume reconstituted per hour of green time

Link data display

SM=LK! Include link data in strategic monitor display.

SM=NL! Exclude link data from strategic monitor display.

Strategic monitor header only

SM=HD! Selects header only.

SM=NL! Reverts to original volume mode (excludes link).

SM=LK! Reverts to original volume mode (includes link).

Entering strategic monitor modes

Strategic monitor modes can be entered in any order, singly or by groups. For example, SM=NL!SM=VOVK! is the same as SM=LKVOVK!

A single mode can be changed without altering any others. For example:

SM=NL! Remove link data.

SM=CVO! Change volume only.

Displaying strategic monitor modes

Current strategic monitor modes can be displayed with the command SM?

Example

SM?

```
NLVOVK
```

Strategic monitor display

A strategic monitor display consists of:

- header
- column title
- strategic approach data
- link data if SM=LK!
- phase data

Example

SM=VOVKLK!

```
08:02 SS24M+ PL7#3 PV 6.2 CL# 98-03 RL 93' SA 12 DS118
  INT  TYPE  PH  PT! DS VO VK! DS VO VK! DS VO VK! DS VO VK!ADS
  637 SA  3  AB  69! 22  6  7! 52 17 17! 25  9  9!     -  -! 52
11224 SA  6  A  104!  3  1  1! 47 25 26! 34 15 17!     -  -! 67
  637 SA  7^  4  60! 34  4  7! 58 12 14! 49 11 13!     -  -! 53
  637 SA  8# C   39! 58  9 10!     -  -!     -  -!     -  -! 16
  637 SA 54* B   28>105 14 16!     -  -!     -  -!     -  -!105
  637 LK  3 'A   60! 34  4  7! 58 12 14! 49 11 13!     -  -!1060
11224 LK  4^'A  104!  3  1  1! 47 25 26! 34 15 17!     -  -!1340
    A=<34>  B=26# C=29
```

Strategic monitor header

```
08:02 SS24M+ PL7#3 PV 6.2 CL# 98-03 RL 93' SA 12 DS118
```

where:

08:02 is the time of day – 24-hour clock

SS24M+ is the monitored subsystem (subsystem 24), requested with SM=24! or SM=24R!

M indicates that this subsystem is married to another subsystem. Note that the master subsystem, one that has subsystem(s) married to it, but is itself not married to a subsystem, will not have an M displayed here. (See AM command for area marriages for subsystem ‘x’, i.e. listing subsystem marriages and subsystem marriages in subsystem data.)

The ‘M’ will be replaced by a ‘#’ if the subsystem has been prevented from marrying with the divorce lock command. See Subsystem divorce.

F Both will be replaced by an ‘F’ if the subsystem has been forced to fallback mode, e.g. SS24F. In this case, the data reflects what the site would be doing if the site were running Masterlink, not what the site is actually doing.

\+ signifies that a marriage vote occurred.

\- shows a divorce vote.

A blank indicates an unmarried subsystem, either because it never marries (e.g. LP1=0!) or because it does not marry at this cycle length (e.g. LP1=*,7B1024!).

PL7#3 shows the active plans for the cycle.

PL7 is the split plan

following the split plan indicates that the split plan is locked. Similarly, if a cross hatch follows the link plan, the link plan is locked.

3 is the link plan. (Link plan can be 0, meaning the data in the link plan is trimmed or 1 to 4.)

F indicates fixed-time mode.

PV 6.2 is the plans voted for.

6 is the first plan (plan 6) is the split plan vote. ‘s6’ means stored plan 6. ‘a6’ means incremental split selection plan 6.

. is a separator

2 is the last plan in the link plan vote

a = incremental split selection

s = stored

CL# 98-03 is the cycle length for the subsystem, in seconds. The -03 is the modification to the cycle length when married, to bring the cycle generator of this subsystem to the correct offset to the cycle generator of the subsystem to which it is married.

symbol preceding the cycle length value indicates that the cycle length is locked.

RL 93' shows the required cycle length in seconds.

' shows that VF1 was exceeded on a strategic approach, a " is used for VF2.

SA 12 is the number of the strategic approach that produced the required cycle length for the subsystem. If the subsystem being monitored is part of a marriage tree, the strategic approach may be from another subsystem that is married by virtue of LQ.

DS118 is the highest lane degree of saturation from the above strategic approach.

Strategic monitor title line

```
INT TYPE PH PT!DS VO VK!DS VO VK!DS VO VK!DS VO VK!ADS
```

The titles line is the second line of a strategic monitor and follows the heading line. It identifies the data that follows on successive lines. The first 4 items in this line are fixed, and are:

INT TYPE PH PT! where:

INT is the site

TYPE is the strategic approach or link identifier

PH is the phase/signal group number

PT is the phase length in seconds

! is a separator from remaining titles

Then follows four columns identifying the lane data. An exclamation mark separates each lane.

Each lane consists of a degree of saturation and a volume type as specified in the strategic monitor mode.

```
! lane  1 ! lane  2 ! lane  3 ! lane  4 !
! DS VO VK! DS VO VK! DS VO VK! DS VO VK!ADS
```

The last item on the line refers to a strategic approach only, relating directly to the options specified in the SK data for the subsystem and cannot be altered by the strategic monitor modes. It can be:

ADS is the average degree of saturation default

AVO is the average measured volume SK=SVVO!

AVK is the average reconstituted volume SK=SV!

Average is 0.45n' + 0.33n'' + 0.22n''' where n', n'' and n''' are values from the active cycle, last cycle and the cycle before.

Strategic approach display in a strategic monitor

```
637 S 3 AB 69! 22 6 7! 52 17 17! 25 9 9! - -! 52
```

where:

637 shows the site (5 characters maximum) of the strategic input that supplied the volume data for the strategic approach.

S indicates strategic approach data.

3 is the strategic approach number. If followed by:

blank indicates that this strategic approach controls cycle length and split plan selection

# indicates that this strategic approach controls only cycle length

^ indicates that this strategic approach controls only split plan selection

* indicates that this strategic approach controls nothing (monitoring only)

AB indicates the phases specified in the strategic input at site 637. If the strategic input has a signal group specified instead of a phase, the signal group number will be displayed, e.g. `637 S 3 5` showing signal group 5.

" indicates VF2 was exceeded, ' is used for VF1

69 is the phase length for the phase(s) in seconds (or seconds green time plus 5 for a signal group)

! is a lane separator

22 is the percentage degree of saturation of the detector specified in position number 1 in the strategic input. The exclamation mark normally preceding this value will be replaced by:

> if the degree of saturation is between 100–199

* if the degree of saturation is 200 or greater

6 indicates an actual count (VO) of 6 vehicles

7 reconstituted volume (VK) used in plan voting. If the FU subsystem option is set, a non-zero VO followed by a zero VK indicates a valid MF update.

! is a lane separator

The remaining figures show the degree of saturation, VO and VK values for the next 3 lanes with dashes indicating either the lane is not specified in the strategic input or it's a non-active lane in the strategic approach.

52 (at end of the line) indicates the average degree of saturation for the strategic approach.

Link display in a strategic monitor

```
11224 L 4^'A 104! 3 1 1! 47 25 26! 34 15 17! - -!1340
```

where:

11224 shows the site (5 characters maximum) of the strategic input that supplied the volume data for the link

L indicates link data

4 is the link number – if any link in the strategic monitor display is followed by a '^' a difference in required cycle lengths will be not be used in determining subsystem divorce.

^ indicates that CL and RL are ignored on this subsystem for marriage/divorce.

' indicates LQ was exceeded.

Note: LQ (other than –1) is ignored if cycle length is less than the highest alternate minimum cycle length.

A is the phase specified in the strategic input at site 11224. If the strategic input has a signal group specified instead of a phase, the signal group number will be displayed.

104 is the phase length in seconds for the phase(s) (or seconds green time plus 5 for a signal group)

! is a lane separator

3 is the percentage degree of saturation of the detector specified in position number 1 in the strategic input. The exclamation mark normally preceding this value is replaced by:

> if the degree of saturation is between 100–199

* if the degree of saturation is 200 or greater

1 is the actual vehicle count (VO)

1 is the reconstituted volume (VK) used in plan voting

! is a lane separator

The remaining figures show the degree of saturation, VO and VK values for the next 3 lanes. The dashes indicating either the lane is not specified in the strategic input or the lane is non-active in the link.

1340 is the link plan vote average volume in vehicles/hour

Active split plan display in a strategic monitor

For example:

```
A=<34> B=26# C=29
```

The phase splits from the active split plan of the critical site will be displayed at the end of the strategic monitor. The following data is displayed.

Stretch phase

The stretch phase (the phase with 0% split) will be calculated and shown inside angled brackets, e.g. A=<34> indicates that A phase is the stretch phase and has an allocation of 34% of the cycle.

Warning: a stretch phase length of zero (i.e. <0>) indicates an error condition – the sum of the minor phases exceeds 100%.

There can only be one stretch phase in a split plan.

Percentage minor phases

Percentage time minor phases are shown without any phase features, e.g. C=29 indicates that C phase is a non-stretch phase with a phase split of 29%.

Real-time minor phases

Real-time minor phases are marked with a cross-hatch (#). For example, B=26# indicates that B phase is a non-stretch phase with a phase length of 26 seconds.

Phases not in sequence

Any phases that are not in the sequence will be shown with a phase split of 1, e.g. D=1. This can occur if the phase is skipped in the split plan or the phase has a phase split greater than 1% (or 1#) but cannot run because it is not in the phase sequence.

Monitoring selection of split plans

At the start of each cycle SCATS Region determines what changes are needed to the active phase splits to best equalise the degree of saturation on all plan-voting strategic approaches. To assist a traffic engineer in determining why SCATS Region produced a particular result, a split plan selection monitor is provided.

The split plan selection monitor displays details of available projections for a single strategic approach or the results after iterating through all strategic approaches that contribute towards the optimisation of the phase splits. The following commands select the source of the data and the frequency of the display.

SB!	Single shot display showing selection results after consideration of all voting strategic approaches for the subsystem of the monitored site.
SBR!	Repeating display of above.
SB*n*!	Single shot display for the nominated strategic approach.
SB*n*R!	Repeating display of above.
SB=*n*!	Single shot display for the nominated strategic approach with subsystem results appended.
SB=*n*R!	Repeating display of above.

Typical split plan selection monitor displays

These are typical split plan selection monitor displays from a subsystem that has a critical site with eight stored plans and two incremental split selection phases.

SB!

```
Plan...0...1...2...3...4...5...6...7...8: SS 1 - 17-MAR-1999 09:17:57
  SA   3   4   3   3   3   3   3   3   3: ISS plan 12 vote A-2 B+2
   %  48   2  37  34  31  28  25  22  19: A<21> B40 C1 D11 E20 F8 G1
  DS 110 199 144 157 172 190 199 199 199: A<19> B40 C1 D11 E20 F10 G1
ISS....9..10..11.*12..13.*14
  SA   3   3   3   3   3   3
   %  46  50  44  17  42  15
  DS 115 106 120 102 126  98
  Plan 12 vote from SA 2, DS 65
```

SB2!

```
Plan...0...1...2...3...4...5...6...7...8: SA 2 - 17-MAR-1999 09:18:01
   %  21  27  41  43  45  47  49  51  53
  DS  53  41  27  26  25  24  23  22  21
ISS....9..10..11.*12..13.*14
   %  23  19  25  17  27  15
  DS  48  59  45  65  41  74
  Plan 12 vote from SA 2, DS 65
```

SB=2!

```
Plan...0...1...2...3...4...5...6...7...8: SA 2 - 17-MAR-1999 09:18:06
   %  21  27  41  43  45  47  49  51  53
  DS  53  41  27  26  25  24  23  22  21
ISS....9..10..11.*12..13.*14
   %  23  19  25  17  27  15
  DS  48  59  45  65  41  74

Plan...0...1...2...3...4...5...6...7...8: SS 1
  SA   3   4   3   3   3   3   3   3   3: ISS plan 12 vote A-2 B+2
   %  48   2  37  34  31  28  25  22  19: A<21> B40 C1 D11 E20 F8 G1
  DS 110 199 144 157 172 190 199 199 199: A<19> B40 C1 D11 E20 F10 G1
ISS....9..10..11.*12..13.*14
  SA   3   3   3   3   3   3
   %  46  50  44  17  42  15
  DS 115 106 120 102 126  98
  Plan 12 vote from SA 2, DS 65
```

Monitoring selection of offset plans

With each cycle, SCATS Region determines what changes are needed to the active offset plan to provide the best offsets between sites. To assist a traffic engineer in determining why SCATS Region produced a particular result, a comprehensive offset plan selection monitor is provided.

The offset plan selection monitor displays details for a single link or the results after iterating through all links that contribute to the selection of offsets. The following commands select the source of the data and the frequency of the display.

LB! Single shot display showing offset optimisation results after consideration of all contributing links for the subsystem of the monitored site.

LBR! Repeating display of above.

LB*n*! Single shot display for the nominated link.

LB*n*R! Repeating display of above.

LB=*n*! Single shot display for the nominated link with subsystem results appended.

LB=*n*R! Repeating display of above.

Typical offset plan selection monitor displays

The following is an example of some typical offset plan selection monitor displays.

LB!

```
LK monitor (SS 1) 17-MAR-1999 09:28:57
Plan 1     2     3     4  VK Volumes/3 mins
     0     0     0     0  best LP1 LK=  0 - Flow:0
     0  2369  1196     0  best LP2 LK=  2 - Flow:23
     0     0     0     0  best LP3 LK=  0 - Flow:0
     0     0  1150  2300  best LP4 LK=  1 - Flow:23

     0  2369  2346  2300  SS vote:LP2
     0     2     0     1  LKs
```

LB1!

```
LK:1 monitor (SS 1) 17-MAR-1999 09:29:02
Plan 1     2     3     4            VK Volumes/3 mins
     0     0    50   100  DB         VK:(now)18,(-1)24,(-2)30
     0     0  1150  2300  Flow*DB    Average VK flow:23 - VB:0
```

LB=1!

```
LK:1 monitor (SS 1) 17-MAR-1999 09:29:06
Plan 1     2     3     4            VK Volumes/3 mins
     0     0    50   100  DB         VK:(now)18,(-1)24,(-2)30
     0     0  1150  2300  Flow*DB    Average VK flow:23 - VB:0
     0     0     0     0  best LP1 LK=  0 - Flow:0
     0  2369  1196     0  best LP2 LK=  2 - Flow:23
     0     0     0     0  best LP3 LK=  0 - Flow:0
     0     0  1150  2300  best LP4 LK=  1 - Flow:23

     0  2369  2346  2300  SS vote:LP2
     0     2     0     1  LKs
```

Monitoring rotation

From SCATS version 6.9.4, you can monitor rotation. Rotation is the variance from the desired start of the cycle generator to the actual start of the cycle generator.

ROT! Shows the rotation table for the subsystem that the monitored site is allocated to.

ROT=*n*! Shows the rotation table for a cycle length of *n* seconds (valid range is 20 to 240). The results show the rotation using the default algorithm (when the SR subsystem option is off) followed by the results using the alternate algorithm (when the SR subsystem option is on). In both cases, the result ranges from –127 to +127.

Subsystem marriages

Listing subsystem marriages

AM=*n*! Lists the marriage tree for subsystem *n*.

AM! Lists the marriage tree for subsystem of the monitored site.

AM! displays:

```
MSnCLy SSa>SSb(1234C) AT#
```

where:

MS*n* means master system *n*.

CL*y* means cycle length *y*.

SS*a*>SS*b* means subsystem *a* is linked to subsystem *b*.

(1234C) means the link is to the end of C phase at site 1234 in SS *b*. (1234^C) means the link is to the start of C phase.

AT# is the point on the master cycle generator where SS*a* has CG=0.

For example, to list marriage tree for subsystem 12:

AM=12!

```
MS2CL120 SS1>SS2(234B)AT37 SS3>SS12(345C)AT63 SS12>SS2(77C)AT66
```

indicates that subsystem 2 is the master subsystem, subsystem 1 links to subsystem 2, subsystem 3 links to subsystem 12 which links to subsystem 2. The common nominal cycle length is 120 seconds, the cycle generator for subsystem 1 will be zero at cycle generator step 37 of the master subsystem etc.

If a subsystem is not married to another subsystem, the data displayed will be:

AM=26!

```
MS26CL88
```

Displayed cycle generator offsets are measured on-line and include any offset errors due to subsystem rotation.

Subsystem divorce

Sometimes it is desirable to divorce a subsystem from another, e.g. increasing cycle length because of roadworks. This can be accomplished using the DV command:

DV=*n*#! Divorce subsystem *n* from any subsystem to which it is married and prevent re-marriage (divorce lock). This command will also set the TRM indicator on top of the SCATS Terminal display.

DV#! As above but for subsystem of the monitored site.

DV=*n*! As above, but the subsystem is free to re-marry at any time. This command does not set the TRM indicator on the top of the SCATS Terminal display.

DV! As above, but for the subsystem of the monitored site.

DV=*n*/ Clear a divorce lock for subsystem *n*.

DV/ As above, but for the subsystem of the monitored site.

ML? List subsystem with divorce lock.

Locking a marriage

This is the complement to the DV command. (DV is a command to break a link between one subsystem and another, and optionally prevent re-linking.)

MG#! If the current subsystem can link to another subsystem on the selected link plan, MG#! forces (or

retains) a link and prevents the link from breaking. If the subsystem cannot link to another, using the `MG#!` command will produce an `*ERROR-INH*` (command or function inhibited).

`MG`*n*`#!` Does the same for subsystem *n*.

`MG/` Removes a locked subsystem link.

`MG`*n*`/` Does the same for subsystem *n*.

Site number from personality

For standard personalities, you can obtain the site number using the `MH` command. First, enter `MR!` to enable the display of controller RAM. Then enter:

`MH8;0!` Display the first byte of the site in hexadecimal.

`MH8;1!` Display the second byte. An alternative is `MH+!` to display the next byte.

Depending on the controller type, the hexadecimal values returned are:

Controller	MH8;0!	MH8;1!
PTF	Low byte	High byte
PSC	High byte	Low byte
Delta 3	High byte	Low byte
Delta 4	High byte	Low byte

Check with your controller manufacturer for other controllers such as PSC2000, QTC etc.

You must then convert the two hexadecimal values to decimal values using the conversion table below, then convert the two decimal values to the site as follows:

site = *low byte* + 256 × *high byte*

For example, if `MH8;0!` returns A3 (i.e. 163 decimal) and `MH8;1!` returns 90 (i.e. 144 decimal) and the controller is a PSC, then the site is 144 + 256 × 163 = 41872.

Hexadecimal conversion table

Hex	Decimal	Hex	Decimal
00	0	00	0
01	1	10	16
02	2	20	32
03	3	30	48
04	4	40	64
05	5	50	80
06	6	60	96
07	7	70	112
08	8	80	128
09	9	90	144
0A	10	A0	160
0B	11	B0	176
0C	12	C0	192
0D	13	D0	208
0E	14	E0	224
0F	15	F0	240

Chapter 15: Manual control

The normal Masterlink operation of computer strategic control that selects the best plan for the prevailing traffic conditions and varies cycle length and green times accordingly, will normally give the best operation.

However, this mode of operation may not always be desirable under certain conditions such as:

- emergencies
- roadworks
- loss of strategic detectors

Fixed-time operation

An alternate mode of operation is fixed-time operation. This is similar to Flexilink operation, in that plans and cycle lengths are determined in advance and are scheduled to operate at appropriate times. However, unlike Flexilink, where the plans and schedules are stored in RAM at the controller, fixed-time operation uses the normal Masterlink plans and cycle length. This mode is normally used in systems that have no strategic detectors.

Each SCATS Region has action lists that can be executed at a scheduled time according to a schedule entry. Each SCATS Region can have up to 250 schedule entries. These schedule entries can be used to execute action lists and the action lists activate the fixed-time plans. See the section on scheduled events for full details on schedules and action list formats.

Fixed-time plan operation works by disabling the adaptive operation of a subsystem and locking the Masterlink cycle length, split plan and offset plan. All sites in the subsystem use the same cycle length, split plan (subject to plan pairing) and link offset plan.

- Fixed-time operation only works with sites running Masterlink.
- Manual locks take priority over fixed-time operation.
- Fixed-time operation can only be invoked by an action list.

Specifying fixed-time plans and cycle length

Fixed-time plans and cycle length are invoked with the FTP command. Note that fixed-time plan is only valid for those sites that are running Masterlink (i.e. include `M` in their link mode specification and are not on fallback).

Fixed-time plan format

To specify fixed-time plan data in an action list, use:

FTP*ss*`=`*sp*`.`*lp*`,`*cl*`!`

where:

ss is a list of the subsystems that the data applies to. For example, `1,3,5-7` applies the data to subsystems 1, 3, 5, 6 and 7.

sp is the desired subsystem plan to be used by these subsystems. This corresponds to the split plan at the critical sites. Other sites in each subsystem use the same split plan number, subject to plan pairing.

lp is the link plan to be used for the determination of offsets between sites or between subsystems. This takes the form of a plan number between 1 and 4 followed by the letter `A` or `B`. As each offset plan has two offset values (e.g. `PP2=23,26C!`), `A` selects the first offset value and `B` selects the second.

cl is the common cycle length. This can be any value between 20 and 240 seconds or alternatively, a number between 1 and 16 selects an entry from the subsystem stored cycle length (FCL) table of cycle lengths.

Not all values need to be specified. For example:

`FTP1-4=3!`	Selects split plan 3 for subsystems 1 to 4.
`FTP7=.4A!`	Selects link plan 4a for subsystem 7.
`FTP12=,100!`	Sets subsystem 12 to 100 seconds cycle length.
`FTP1=0.0,0!`	Removes fixed-time plan operation from subsystem 1.
`FTP2=n.0,m!`	Removes single item referenced by the zero.

Fixed-time plans and cycle lengths can only be scheduled from an action list.

The data is loaded and automatically enabled.

Dynamic Masterlink mode is suspended while the fixed-time plan is active.

Locking fixed-time plan data

Loaded fixed-time plans and cycle length can be prevented from being changed by another scheduled fixed-time plan by locking the active values. A subsystem number or range of subsystem (or * for all subsystems) can be optionally specified. If omitted, the commands operate on the current subsystem. The equals sign preceding the # is also optional.

FTP#!	Locks the current fixed-time plans, preventing further scheduled changes. Scheduled fixed-time plan data is still loaded but is kept as pending until the fixed-time plan lock is removed.
FTP*n***#!**	Ditto, but for plan *n*.
FTP#/	Removes the fixed-time plan lock and loads the pending fixed-time plan data.
FTP*n***#/**	Ditto, but for plan *n*.

Listing fixed-time plan status

FTP?	Lists the active fixed-time plans and cycle length for the current subsystem and also shows the fixed-time plan status.
FTP*n***?**	Lists the fixed-time plans and status for subsystem *n* where *n* is a single subsystem, a range, a group or * for all subsystems.

Even though fixed-time plans and cycle length may be listed, they may not be active.

If a slash follows the data, as in `FTP? 4.4A,80/`, the plans and cycle length are loaded but not active.

If no slash is shown, the data is active.

FTP1,4-6?	Lists the fixed-time plans, cycle length and status for subsystem 1, 4, 5 and 6.

Overriding fixed-time plan operation

Scheduled fixed-time plan operation can be overridden by the `FTP#!` command or by manually locking a plan and cycle length using the `PM` command, e.g.

```
PM3=2#2B#,100#!
```

This locks split plan 2, link plan 2B and a 100-second cycle length.

Removing the manual locks (i.e. `PM/`) reverts the operation to the active fixed-time plan values.

Manually controlling subsystem plans

If a subsystem plan or link plan is changed using the `PM` (plan manual) command, the subsystem is free to change plans in future cycles unless the split plan or link plan is locked. When a plan is locked, strategic plan selection is removed from the subsystem for that plan type.

Locking plans for specific subsystems

The following commands refer to subsystem number n, which can be a single number as in `PM3`, all subsystems as in `PM*` or a range as in `PM3-8,11,14`:

PM*n*=*y*!	Change subsystem to split plan *y* (link plan unchanged).
PM*n*=*y*#!	Lock subsystem on split plan *y* (link plan unchanged).
PM*n*=.*z*!	Change subsystem to link plan *z* (split plan unchanged).
PM*n*=.*z*#!	Lock subsystem to link plan *z* (split plan unchanged).

Even though the link plan is locked, SCATS Region is free to choose either the A offset or the B offset and may even interpolate between the two offsets, depending on cycle length and the values in PS (see Selecting offsets using PS in Subsystem data).

PM*n*=.*z***A**#!	Selected link plan may optionally include the specific offset value A or B, thereby forcing SCATS Region to use either the A offset value or the B offset value regardless of the subsystem cycle length.
PM*n*=*y*.*z*!	Change subsystem to split plan y and link plan *z*.
PM*n*=*y*#*z*!	As above, but locks split plan.
PM*n*=*y*.*z*#!	As above, but locks link plan.
PM*n*=*y*#*z*#!	As above, but locks split plan and link plan.
PM*n*=,*x*!	Changes cycle length to x seconds.
PM*n*=,*x*^!	Locks cycle length to x seconds.
PM*n*=*y*#*z*#,*x*^!	Locks plans and cycle length.
PM*n*=/	Remove all plan locks (but not cycle length lock) from subsystem n. Use CL*n*/ to remove a cycle lock.
PM*n*?	List active plans and cycle length for subsystem n.
PL#?	List subsystem numbers with a split plan lock or a link plan lock.
ML?	List all locks and trims on the region.

Locking plans for the monitored site

When the subsystem number is omitted from the PM commands, they operate on the subsystem of the monitored site.

PM=*y*!	Change subsystem of monitored site to subsystem plan *y*.
PM=*y*#!	Lock subsystem of monitored site on subsystem plan *y*.
PM=.*z*!	Change subsystem of monitored site to link plan *z*.
PM=.*z***A**!	Change subsystem of monitored site to link plan *z*, offset A.
PM=.*z*#!	Lock subsystem of monitored site to link plan *z*.
PM=.*z***B**#!	Lock subsystem of monitored site to link plan *z*, offset B.
PM=*y*.*z*!	Change subsystem of monitored site to subsystem plan *y* and link plan *z*.
PM=*y*#*z*!	As above, but locks subsystem plan.
PM=*y*.*z*#!	As above, but locks link plan.
PM=*y*#*z*#!	As above, but locks subsystem plan and link plan.
PM=,*x*!	Changes cycle length to *x* seconds.
PM=,*x*^!	Locks cycle length to *x* seconds.
PM=*y*#*z*#,*x*^!	Locks plans and cycle length.
PM/	Removes all plan locks (but not cycle lock) from subsystem of monitored site.
PM*/	Removes plan locks from all subsystems.
PM?	Lists subsystem plan, link plan and cycle length for subsystem of the monitored site.
PL#?	Lists subsystem numbers with a split plan lock or a link plan lock.

ML?	Lists all subsystems with link plan, subsystem plan and/or cycle length locks.

Active split plan

Values shown inside the brackets are optional.

IP#[;*t*]**!**	Reloads the stored split plan at the monitored site and locks it for the specified duration.
IP=#[;*t*]**!**	Locks the active split plan at the monitored site for the specified duration without reloading it.
IP[#]**/**	Clears the lock on the active split plan at the monitored site and reloads the stored split plan.
IP=[#]**/**	Clears the lock on the active split plan at the monitored site without reloading it.

Active offset plan

Values shown inside the brackets are optional.

PP#[;*t*]**!**	Reloads the active offset plan and lock it for the nominated time.
PP=#[;*t*]**!**	Locks the active offset plan – no reload.
PP[#]**/**	Clears the active offset plan lock – reload the active offset plan.
PP=[#]**/**	Clears the active offset plan lock – no active offset plan reload.

Active link plan

Values shown inside the brackets are optional.

The following commands to lock a link plan operate on the subsystem to which the monitored site belongs or, if immediately preceded by a subsystem number, they operate on the nominated subsystem.

LP#[;*t*]**!**	Reloads the active link plan and lock it for the nominated time.
LP=#[;*t*]**!**	Locks the active link plan – no reload.

The following commands to clear a link plan lock operate on the currently set subsystem pointer (e.g. the subsystem returned by SS?) and not the subsystem to which the monitored site belongs.

LP[#]**/**	Clears the link plan lock – reload the active link plan.
LP=[#]**/**	Clears the link plan lock – no active link plan reload.

Subsystem plan control

Values shown inside the brackets are optional.

SP#[;*t*]**!**	Reloads the active link plan and lock it for the nominated time.
SP=#[;*t*]**!**	Locks the active link plan – no reload.
SP[#]**/**	Clears the subsystem plan lock – reload active split plans at all sites.
SP=[#]**/**	Clears the subsystem plan lock – no reload of active split plans at sites.

Duration of locks

The default duration of a lock is 1 hour if applied from a command-line interface, 1 day if applied from a variation routine or permanent if applied from an action list. To override the default behaviour when applied from a command-line interface or action list, the lock symbol (#) is followed by a semi-colon and duration. Using a cycle length lock as an example, the duration can be specified as follows:

- `CL=90#!` uses the default duration
- `CL=90#;100!` or `CL=90#;100M!` specifies the duration in minutes
- `CL=90#;3:30!` or `CL=90#;3H30M!` specifies the duration in hours and minutes
- `CL=90#;1:12:00!` or `CL=90#;1D12H0M!` specifies the duration in days, hours and minutes
- `CL=90#;*!` specifies the duration to be permanent

Note that the default units for the duration are in minutes. The maximum duration of a timed lock is 1 week.

Use ML? to show the duration and time remaining.

All timed locks will be removed automatically when the timer expires. They can also be removed before the timer expires via a command-line interface, graphical user interface or action list. Permanent locks must also be removed via a command-line interface, graphical user interface or action list.

Note: Timed locks were introduced in SCATS Region version 6. The timed locks (TL) region option was used to enable and disable this feature, so that it could be disabled if the region was connected to a VAX. The TL region option no longer does anything, so timed locks are always enabled.

Listing locks and trims

SCATS Region keeps a record of the specified duration of a lock or dwell, the remaining time until automatic removal and the source of the lock. It also records the source of certain trims.

Consequently, the format for displaying locks, trims and dwells has changed. This can be seen in the following example:

ML?

```
Int 1: LMM# Permanent Lock -TC
Int 2: PL3# 2 hr lock, 1 hr 35 mins remaining, Operator:1
Int 3: dwelling A phase for 5:00 mins, 4:45 remaining, Operator:23
Int 4: PL0 Trim -ISS SS3: SP1# 1 hr lock, 14 mins remaining, Operator:4
SS1: CL120# 2 hrs 45 mins lock, 32 mins remaining, Operator:1
```

Manually modifying subsystem cycle length

CL=*n*!	Raise cycle length to *n* seconds but do not lock.
CL=*n*#!	Lock cycle length of subsystem of monitored site to *n* seconds. *n* must be greater than minimum cycle length for the system. This lock will affect all subsystems in a marriage. If the subsystem being locked is the master, then the lock will become effective upon the marriage more quickly.
CL#!	Locks cycle length for subsystem of the monitored site.
***y*!CL=*n*#!**	Locks cycle length for subsystem of site *y*.
SS=*y*!CL=*n*#!	Locks cycle length for subsystem *y*.
SS=*y*!CL/	Remove cycle length lock from subsystem *y*.
***y*!CL/**	Remove cycle length lock from subsystem for site *y*.
CL*y*=*n*#!	Locks cycle length for subsystem *y*. This format allows a range of subsystem numbers to be specified as in CL1-3,6,9-11. Note that SS1-3,6,9-11! is invalid, as the SS command can only specify a single value such as SS=3! or all numbers as in SS=*!
CL*y*/	Remove cycle length locks from subsystem *y* as in CL1-8,15/
CL*/	Use an asterisk if the actions are to apply to all subsystems.
CL?	List cycle length of subsystem of current site.
CL*y*?	List cycle length for subsystem *y*, e.g. CL1-3,6,9-11?
SS=*y*!CL?	List cycle length of subsystem *y*.
CL#?	List all subsystems with cycle length locks.
ML?	Manual locks – lists sites with trims and dwells and subsystems with plan or cycle length locks. If followed by -DSK, the lock or trim has been scheduled from an action list.

Cycle length lock rules

An *ERROR-LCK* will be produced if an attempt is made to change (not lock) a cycle length in a marriage that has a cycle lock on any subsystem.

Applying a different cycle lock value to any subsystem will remove all other cycle length locks in the entire marriage.

A subsystem with a cycle length lock is prevented from joining a marriage if the marriage contains a cycle length lock of a different value (regardless of LQ!).

Trimming the active plan

In certain circumstances such as when systems first operate under Masterlink, or during sporting fixtures, trimming should be performed.

Each site has 1, 4, 8 or 16 stored split plans plus an active plan.

Every time a split plan change occurs, the new plan data is copied from the storage area to the active plan. The active plan can be modified without affecting the stored plan data.

The 'trim' indicator is set when a manual change is made to the active plan, e.g. B=+10!.

As the active plan is overwritten whenever a plan change occurs, it is recommended to lock the active plan to avoid losing any trim information.

PL!	Set the plan pointer to the active plan.
PL!L!	List active split plan (similarly PL,L!).
PL#!	Lock the active plan. Other sites in the subsystem are free to change split plan.
PP0=*x*,*yz***!**	Trim the active offset plan – *x* and *y* are offsets and *z* is end of the PP phase.
PP0=*x*,*y***^***z***!**	Trim the active offset plan – *x* and *y* are offsets and **^***z* is start of the PP phase.
PP0#=*x*,*yz***!**	Lock the active offset plan – other sites in the subsystem are free to change offset plan. The offset plan will follow the split plan if SK=SP! in the subsystem data.
PP0#=*x*,*y***^***z***!**	As above, but start of *z* phase.
PP0?	List active offset plan data.
PL/	Remove the trims and locks on the split plan and offset plan – reload the currently selected plan.
ML?	List all locks, trims and dwells that are applied. Those locks or trims with -DSK appended are applied from an action list.
PL*n***#!**	Lock site to plan *n*.

Modifying the active plan

The active split plan phase splits can be altered with:

A=+3!	Add 3% to A phase.
B=-5!	Subtract 5% from B phase.
	Note: Using this method on the stretch phase of a slave site will change the offset, not the split. The offset plan offset cannot be altered by + or –. The length of the stretch phase cannot be altered using + and – values; time must be added to or subtracted from one or more of the minor phases.
C=27!	Set C phase split to 27%.
C=B!	Set phase sequence from C to B phase.
C=PDB!	Replace phase features and sequence.
C=25NSB!	Replace phase split, phase features and phase sequence.
C=+PD!	Add a permanent demand to C phase.
C=-PD!	Remove the permanent demand from C phase.
PL/	Cancel locks on active split plan and active offset plan at a site, and reload the active plans with data from the selected stored plans.

Typical split plan trims

Typical plan:

```
I=411!PLAN=4!SF=DC!
A=0PDB!
B=27NSC
C=18A
```

Typical trims:

larger A required	`B=-15`	time taken from B
larger B required	`B=+10!`	time taken from A (stretch phase)
larger C required	`C=+6!B=-6!`	time taken from B
larger C required	`C=+6!`	time taken from A (stretch phase)
remove special facility DC	`SF=!`	disables double cycling

Temporary link mode

Link mode determines the operating mode of the site, and is stored in the link mode specification of the site data. This data is fixed, and can only be changed with the appropriate access level. However, the fixed link mode can be overridden with a temporary link mode. Only one mode may be selected:

LM=M#!	Lock site to Masterlink.
LM=F#!	Lock site to Flexilink.
LM=I#!	Lock site to isolated.
LM/	Cancels link mode lock, clears ‘force isolated’ and ‘force Flexilink’.
SS=3!LM=F#!	Locks Flexilink mode for all sites in subsystem 3.
I=*!LM?	List the link mode at all sites.

A site locked to any mode can still be dwelled.

Special facility flag locks and trims

The following commands are used to set or clear special facility flags (i.e. Y-, Z- or Z+) for the active split plan by applying locks or trims. These work with SCATS Region version 6.8.3.1 or later.

Y-=+!	Turns Y- on at the monitored site. This is applied as a trim.
Y-=!	Same as above.
Y-=-!	Turns Y- off at the monitored site. This is applied as a trim.
Y-=+#[;*t*]**!**	Turns Y- on at the monitored site. This is applied as a lock. See Duration of locks for a description of the optional duration.
Y-=#[;*t*]**!**	Same as above.
Y-=-#[;*t*]**!**	Turns Y- off at the monitored site. This is applied as a lock.
Y-/	Clears the Y- lock or trim.
Y-=/	Same as above.

In all the above commands, Y- can be replaced by Z- or Z+.

Note: Prior to SCATS Region version 6.8.3.1, special facility flags were locked or trimmed by locking or trimming the active split plan and changing the special facility flag using the SF command. This method is discouraged, as it disables incremental split selection (ISS).

Extra special facility flag locks and trims

The following commands are used to set or clear extra special facility (XSF) flags for the active split plan by applying locks or trims. These work with SCATS Region version 6.8.3.1 or later.

XSF=+2,5-7,-3!	Turns XSF flags 2,5,6,7 on and XSF flag 3 off at the monitored site. These are applied as a trim.
XSF=+2,5-7,-3#[;*t*]**!**	Turns XSF flags 2,5,6,7 on and XSF flag 3 off at the monitored site. These are applied as a lock. See Duration of locks for a description of the optional duration.
XSF=2,5,7/	Removes the locks and trims for XSF flags 2, 5 and 7 at the monitored site and clears the flags.
XSF=*/	Removes all locks and trims for XSF flags at the monitored site and clears the flags.

Remote special facility flag locks and trims

The following commands are used to set or clear remote special facility (RSF) flags by applying locks or trims. These work with SCATS Region version 6.8.3.1 or later.

RSF=+2,5-7,-3!	Turns RSF flags 2,5,6,7 on and RSF flag 3 off at the monitored site. These are applied as a trim.
RSF=+2,5-7,-3#[;*t*]**!**	Turns RSF flags 2,5,6,7 on and RSF flag 3 off at the monitored site. These are applied as a lock. See Duration of locks for a description of the optional duration.
RSF=2,5,7/	Removes locks and trims for RSF flags 2,5,7 at the monitored site and clears the flags unless they are set by VR46.
RSF=*/	Removes all locks and trims on RSF flags at the monitored site and clears all flags that were not set by VR46.

Z flag locks and trims

The following commands are used to set or clear Z flags using locks or trims. These work with SCATS Region version 6.8.3.1 or later.

Z=+2,-4!	Turns Z flag 2 on and Z flag 4 off at the monitored site. These are applied as a trim.
Z=+2,-4#[;*t*]**!**	Turns Z flag 2 on and Z flag 4 off at the monitored site. These are applied as a lock. See Duration of locks for a description of the optional duration.
Z=2,4/	Removes locks and trims for Z flags 2 and 4 at the monitored site and clears the flags.
Z=*/	Removes all locks and trims for Z flags at the monitored site and clears the flags.

Dwell commands

Dwells send calls for demanded phases in sequence, but force early maximums, to reach the desired phase as quickly as possible. A site running Masterlink, Flexilink or isolated may be dwelled.

Dwelling should only be carried out during special situations such as processions or emergencies. Plan trims should be used to clear traffic queues.

A dwell on or off prints a status message for the site.

You cannot apply dwells from an action list.

ADW[;*t*]**!**	Set dwell on A phase on monitored site (BDW! for B phase etc.). (See note below for timed dwells.)
ADWN!	As above, but do not skip any demanded phases that are in the phase sequence before the dwell phase.
DW/	Remove the dwell on the monitored site whether manually applied or from a dwell

	store.
I=*!DW/	Remove dwells from all sites in the monitored region.
DWS*n*=A!	Store A phase dwell in dwell store *n* for the monitored site. (DWS*n*=B! for B phase etc.)
DWS*n*!	Apply the dwells stored in dwell store *n*, where *n* is 1–30.
DWS*n*/	Removes dwells appearing in dwell store *n* only.
DWC*n*!	Clears dwell store *n*.
DW?	List applied dwells (to check if the store is correctly written). Those marked # are applied. Those not marked # are in the dwell store but are not active.
DWP=*p*#[;*t*]!	Prevent dwells applied at or below priority *p* (where *p* = 1 to 8) at the monitored site for time *t*. The time *t* may be expressed in minutes or hours and minutes. When expressed in minutes, the time is interpreted as follows: ■ 1–10080 means time in minutes ■ 65535 or * means permanent When expressed in hours and minutes, the time is interpreted as follows: ■ *h*:*m* where hours is 0 to 168 and minutes is 0 to 10080 and the total of hours × 60 + minutes is 1 to 10080 The maximum time is 7 days. If the time is omitted, it defaults to 1 hour.
DWP[=][#]/	Clear the dwell prevention at the monitored site.
DWP*[=][#]/	Clear the dwell prevention at all sites in the monitored region.
DWP[=]?	Show the status of dwell prevention at the monitored site.
DWP*[=]?	Show the status of dwell prevention at all sites in the monitored region.

An *ERROR-I/O* message is generated if you try to dwell a site with a stopped talking (ST) or power failure (PF) alarm (i.e. not communicating).

Duration of dwells

The default duration of a dwell is 5 minutes if applied from a command-line interface or permanent if applied from a variation routine. To override the default behaviour when applied from a command-line interface, the dwell command is followed by a semi-colon and duration. Using a dwell for B phase as an example, the duration can be specified as follows:

- BDW! uses the default duration
- BDW;75! specifies the duration in seconds
- BDW;1:20! specifies the duration in minutes and seconds
- BDW;*! specifies the duration to be permanent

Note that the default units for the duration are in seconds. The maximum duration of a timed dwell is 15 minutes.

Use ML? to show the duration and time remaining.

All timed dwells will be removed automatically when the timer expires. They can also be removed before the timer expires via a command-line interface or graphical user interface. Permanent dwells must also be removed via a command-line interface or graphical user interface.

Dwells applied from a dwell store are always permanent.

Note: Timed dwells were introduced in SCATS Region version 6. The timed locks (TL) region option was used to enable and disable this feature, so that it could be disabled if the region was connected to a VAX. The TL region option no longer does anything, so timed dwells are always enabled.

Example of stored dwells

Note: This is superseded by route pre-emption plans.

Enter `411!DWS1=A!412!DWS1=A!413!DWS1=B!414!DWS1=A!`

The dwells for the four sites are now stored in dwell store number 1 for later use.

To check if the store is correctly written, enter `DW?` the response to this should be:

```
411:1=A 412:1=A 413:1=B 414:1=A
```

When dwells have to be repeated along different sections of road at regular intervals (e.g. from an airport to a hospital), the required dwells can be stored in an action list to enable easy recall.

Dwell tables can be entered in an action list. The `RTC` command can then be used to read the action list by number.

The first command to follow the identification number must be a command to clear the desired dwell table. The dwells then follow, with the site specified first, followed by the dwell store/phase command.

RTC=*n*! The desired dwells can be read from an action list with the `RTC` command where *n* is an action list number between 1 and 64999.

Example of dwells stored in an action list

```
51:
; dwells for Flinders St - city bound - read by RTC=51!
DWC1!
44!DWS1=A!
27!DWS1=C!
422!DWS1=A!
685!DWS1=B!
2146!DWS1=A!
534!DWS1=A!
DWC2!
; dwells for Oxford St - city bound
684!DWS2=A!
683!DWS2=A!
682!DWS2=A!
681!DWS2=B!
292!DWS2=A!
2321!DWS2=A!
315!DWS2=B!
```

Note that the action lists must be maintained using the SCATS Access action list editor on the SCATS Central Manager if the region is connected to a SCATS Central Management System.

Remote activation of a route

It is possible to start a route that has previously been loaded on the Central Manger from a remote location. The required route may be loaded from an emergency vehicle headquarters (i.e. ambulance headquarters or fire brigade headquarters).

A workstation that connects to the SCATS Central Manager needs to be installed at the emergency vehicle headquarters. From this terminal, an operator has access to the `RPC>` prompt from a captive account which does not allow access to SCATS Region traffic monitoring.

On receipt of an emergency call, the operator must:

- determine which vehicle is to attend the call – this vehicle would normally be stationed remotely from the headquarters.
- select the appropriate RPC route for this vehicle.
- contact the vehicle crew, informing them of the destination and the route to be taken.
- load the route from the `RPC>` prompt.

For remote activation of the route, the station housing the vehicle requires two pieces of hardware to be connected to a nearby site that is communicating with a SCATS regional computer that in turn is communicating with the SCATS Central Manager.

- an indicator connected to a signal group at the controller module at the site
- a button connected to a detector input at the controller

When the appropriate route is loaded, the indicator will show at the vehicle station. When the crew is ready to leave, an officer must press the button to activate the route.

RPC control

When a route is loaded in the SCATS Central Manager, the route number is checked against the ranges of routes specified at the beginning of the route database and if a match is found, the site is noted.

When loading is completed, a message is sent from the SCATS Central Manager to the SCATS Region containing the site, where it is picked up by variation routine 50 for that site. Variation routine 50 then sends an extra special facility flag to the controller. The controller turns on the indicator at the remote location.

When the push button is pressed, the controller sends a miscellaneous status flag to the region where it is detected by variation routine 50 for that site, which sends a message to the SCATS Central Manager. Receipt of this message will start the route.

Route pre-emption data

Data for all routes are stored in the SCATS Central Manager database. Information in the database must be maintained using the route editor function in SCATS Access.

Remote activation format

The database must contain a list of sites and route numbers used for this control, and must precede the first route number in the database. Each entry consists of a site followed by the lowest and highest route numbers to be controlled. If a site controls more than one consecutive group of route numbers it should have multiple entries.

RPC route format

Each route is numbered. Route numbers can be between 1 and 32699.

The route data, with fields separated by any combination of spaces, tabs or commas, is in the following format:

intno phases delay hold xsf

where:

intno is the site

phases is the desired phase possibly followed by acceptable alternate phases

delay is the delay in seconds from the dwell activation of the previous site (or route activation if this is the first site in the route) until the dwell activation of this site

+ a positive value is used to start a dwell after the nearest preceding positive delay site activates its dwell. The dwell is activated when the counter decrements to zero.

0 a zero is used to start a dwell simultaneously with the nearest preceding positive delay site.

- a negative value is used to start a dwell before the nearest preceding positive delay site activates its dwell. The dwell will be activated when the sum of the preceding positive delays equals the negative value.

* an asterisk may be used to hold the timing at this point allowing manual override of the route.

hold is the duration of the dwell signal in seconds. A value of zero prevents a dwell from being introduced to allow a route to be monitored but not activated.

xsf is any combination of S1, S2 or S3 and refers to extra special facility flags that should be turned on for the duration of the dwell. By preceding the signal with a minus (-S1) that signal will be turned off for the duration of the dwell.

Comment

The data may contain comments that are identified by a semicolon as the first character.

Example

```
1:
; 6100A,6101B,6102C,6260A,6261B,6200A,6201B,6420A,6140B
6100 A 0 20
6101 B 10 20
6102 C 10 30
6260 A 10 30 S2 -S3
6261 B 10 30
6200 A 10 30
6201 B 10 30
6420 A 10 30
6140 B 10 30
```

Detector actuations

From SCATS Region version 6.9.3.2, a user can place artificial detector actuations at a site that uses a VC5.1 controller. Each detector actuation can be either a 4-second timed actuation (to simulate a vehicle passing over a detector) or an untimed actuation (to simulate a vehicle stopped on a detector). The untimed actuations can also be cleared.

The detector actuations are placed on the logical inputs using the `IA` command as described below. `IA` is a mnemonic for Input Actuation.

IA?	List the permanent input actuations.
IA=*n***!**	Place a timed detector actuation on detector *n*.
IA=*n***#!**	Place an untimed detector actuation on detector *n*.
IA=*n***-***q***,***s***#!**	Place an untimed detector actuation on multiple detectors. The dash is used to indicate a range. The comma is used to indicate a list.
IA=*n***/**	Clear untimed detector actuation on detector *n*.
IA/	Clear all untimed detector actuations.

The above commands only work for a specific site. The `I=*!` wild card is not allowed.

Chapter 16: Site-related data

Listing a file

LST=*filename*! List the contents of the specified *filename* at the terminal. TYP=*filename*! is an alternative. The default folder is **ScatsData**.

For example, LST=..\Sys\Sys.tc! to list the contents of the **Sys.tc** file in the SCATS Region's **Sys** folder.

Listing site RAM data

SCATS Region maintains a copy of controller RAM data. This is read from the **Sys.ram** file at startup. Changes to RAM are saved to this file so that SCATS Region can reload it if it is restarted.

RAM! This is a special command to list all RAM data from SCATS Region memory for the site being monitored. The listed data consists of controller time settings and Flexilink plans and schedules. This data is useful for checking RAM update (UD), inhibit (IH) and invalid RAM (IR) alarms. The data should be compared with RAM data from the site, obtained with the TSR*? or CR? commands.

CR? List equivalent data direct from controller RAM.

CRC! Compare controller RAM with disk RAM backup.

CRS! Controller RAM save. Uploads RAM data from a site provided no RAM data exists in the SCATS Region RAM copy area. See ZD! command.

Controller time settings

Normal time settings for phases, pedestrians, presence timers, red timers and miscellaneous stores are stored in each controller in a programmable read only memory referred to as an EPROM. This EPROM must be present in a controller before that controller can operate under a SCATS Region.

- Data in EPROM is fixed and cannot be altered from a SCATS terminal. Each controller also contains random access memory (RAM). Amended time settings can be stored in RAM.
- All data stored in RAM is also backed up on disk at the region.
- When you enter controller time settings (or Flexilink plans or schedules) for a site, the information automatically goes to the site and to the disk backup file **Sys.ram**. If the site is not communicating, it only goes to the file but will be automatically downloaded to the site when the communications is restored.
- RAM data in the controller can be lost (e.g. due to a power failure), while EPROM data is permanent.

However, if RAM data is lost due to any circumstance, the region can update lost RAM data from the backup RAM data stored on disk. RAM data is automatically updated on disk.

Special text files

The following commands read an appropriate text file and list all lines of data beginning with the number of the monitored site. A site may have leading blanks.

A line is limited to eighty characters for display purposes, including the site.

Comment records, with a semi-colon (;) as the first character may be included. Comment records are ignored.

If any errors are found in the data on file or if you wish to have data added to a file for a particular site, contact the officer in charge of that regional computer.

Detector-related data

DET! Reads the **Sys\Sys.det** file and lists all records starting with the monitored site. The file usually

includes information of general interest, detector alarms and special facilities for the site.

Site location data

MAP! Reads the **Sys\Sys.map** file and lists general information for the monitored site. This file usually contains the location of the site, the communications line identification number, the location of the line termination at the regional computer, the slot number allocated to the site in the computer, the initials of the responsible officer and the backup officer and the operational status of the site.

Note: This file does not exist from SCATS Region version 6 onwards. The equivalent data is stored in the SCATS Central Manager database.

Example of a Sys.map file

```
TCS  ADDRESS              NEX        KR   SL RO/BU LM
  2  BRIDGE RD & ROSS ST  N2048719P  A38  20 AB/CD F
 38  PMTA RD & BLAND ST   N2048731P  A56  41 SG/WH MF^
140  PMTA RD & DALHOUSIE  N2048729P  A54  39 SG/WH MI
```

Copying a site

The USE command copies site data from a nominated site to an unused slot (i.e. one with INT=0!).

If you attempt to copy to a used slot, *ERROR-INH* will occur as the copy is inhibited.

SL=32!USE[=]1234! If slot 32 has INT=0!, this command will duplicate the data from site 1243 in slot 32. The subsystem number and communication port number will both be set to zero at the destination slot, i.e. S#=0! and COM=0!. As well as this, all dynamic data copied from the source slot will be cleared, i.e. alarms, running phase, green time etc.

The USE command by itself acts on the monitored slot.

No Flexilink data, controller RAM times, message lines or graphics data will be copied.

This command always required command confirmation regardless of the CC region option.

Time setting listings

There are four data source options. The most commonly used source for data checking are those times currently used by the controller either in RAM or EPROM. To access these times, use the prefix TSC.

There are 4 prefixes:

TSC Time settings controller – read the settings that the controller interprets (this can differ from TSN due to time switch settings or where the personality directs the controller to look at other phase switch settings). The fourth character in the command string indicates which particular time settings are required to be listed. * is wild and displays all appropriate time setting categories.

TSP Time settings EPROM – read contents of EPROM.

TSR Time settings RAM – read contents of RAM.

TSN Read RAM – if no entry then read EPROM.

Examples

TSR*? List all time settings in the controller RAM.

TSC*? List all time settings used by the controller.

TSCB*! List all the B phase settings used by the controller.

Phase settings (A to G)

The following suffixes define the time setting mnemonics related to a single phase that must be appended to:

- the appropriate time setting source, e.g. TSC, TSP, TSR or TSN

- the required phase letter (A to G)

LS Late start (e.g. TSPBLS? to list the EPROM late start time for B phase)

MG Minimum green

EG Early cut-off green

YE Yellow

RE All-red

IN Increment

MV Maximum variable initial green

G1 Gap 1

H1 Headway 1

W1 Waste time 1

MA Maximum green

***** This displays all time settings for the phase

The absolute minimum phase length is the sum of the minimum green, yellow and all-red times.

The minimum phase length is further affected by the conditional phase intervals (late start, variable initial green and early cut-off green) and the walk and clearance intervals associated with any pedestrian movements demanded for the phase.

When running isolated or Flexilink, the maximum phase length is the sum of the minimum green, maximum green, early cut-off green, yellow and all-red times.

When running Masterlink, the maximum phase length is calculated by SCATS Region.

Phase gapping in any mode is controlled by the setting of the gap, headway and waste timers.

Pedestrian settings (P1–P8)

The following mnemonics access the pedestrian time settings.

The general format is:

TS[*location*]**P**[*ped*][*time setting*]**?**

where:

location is the source of the time setting (**C**, **P**, **R** or **N** as in TSC etc.)

ped is the pedestrian movement number (1-8 as in TSCP2 etc.)

time setting is one of the following:

***** displays all pedestrian time settings if the pedestrian number is omitted, e.g. TSRP*? for RAM times for all pedestrian settings.

***** displays all time settings for the nominated pedestrian number, e.g. TSCP1*? for pedestrian movement 1.

WK is the walk 1 time setting, e.g. TSCP2WK? for pedestrian 2 time from the controller

C1 is the clearance 1 time setting, e.g. TSRP3C1? for pedestrian 3 from RAM

C2 is the clearance 2 time setting, e.g. TSPP4C2? for pedestrian 4 EPROM time

DY is the delay time setting, e.g. TSPP1DY? for pedestrian 1 EPROM time

Presence timers (1–24)

A controller supports 16 presence timers, or 24 if VC4 or greater, accessed by appending **PT***n* (where *n* is the timer number) to the desired time setting source location (TSC, TSP, TSR or TSN), e.g.

TSCPT*? Displays all controller presence time settings.

TSRPT1? Displays the setting on presence timer 1 from RAM.

TSCPT2? Displays presence timer 2 from EPROM etc.

Special-red time settings (1–7)

Seven special-red time settings are supported, one for each phase, accessed by appending a phase letter and the letters SR, to the desired time setting source location (TSC, TSP, TSR or TSN), e.g.

TSCASR? Display the controller A phase special-red time setting.

TSPBSR? Display the EPROM B phase special-red time.

Miscellaneous stores

Thirty additional stores (or 40 if controller is VC4 or greater), commonly used for signal group minimum times, are available. These are accessed by appending **S***n* (where *n* is a store number) to the source location (TSC, TSP, TSR or TSN). As well, an offset time (OF) and a storage time (ST) are supported, e.g.

TSCS1? Controller time for special time number 1

TSRS*? RAM times for all special times 1 to 30

TSRS23? Offset time for vehicle-pedestrian (V-P) link. A second offset time may be placed in S21.

TSRS24? Storage time for V-P link. A second storage time may be placed in S22.

Time-of-day control

A controller may have a special feature controlled by time of day. To allow for this, the locations TSH (time start hours), TSM (time start minutes), TFH (time finish hours) and TFM (time finish minutes) are available in VC4 controllers or greater, e.g.

TSCTSH? List start time in hours (using a 24-hour clock) for controller.

TSRTFM? List finish time in minutes from RAM.

Comparing RAM data

RAM data in a controller can be compared with the backup RAM data on disk file **Sys.ram**, to check if the RAM data has changed.

CRC! Compares data in RAM at the controller with the backup RAM data on disk file **Sys.ram**.

CRS! When you enter RAM or Flexilink data for a site that is communicating with SCATS Region, the data is saved in RAM at the site and in the data backup file **Sys.ram**. If the backup data on **Sys.ram** is lost (faulty disk etc.) and the data still exists in the controller RAM, you can upload the data from the site using ZD! (to delete the data on disk), then entering CRS! (controller RAM save).

Comparing old format Sys.prom with new format Sys.times

SCATS 6.9.4 introduced a new **Sys.times** file for RAM/ROM time settings data.

CMP! Compares old format **Sys.prom** data with new format **Sys.times** data for the monitored site.

CMP*! As above, but for all sites in the monitored region.

Presentation of listed time setting data

When time settings are listed, the following convention is used:

=4.5! Time setting is 4.5 seconds

/ No entry available.

=E! Error – invalid data is stored in the location

*4! Setting is 4 units of time (early Philips PSF controller). Check multipliers for value.

Multipliers in Philips PSF controllers

Location	Multiplier
Late start	1.0
Minimum green	1.0
Variable increment	0.2
Maximum variable green	2.0
Early cut-off green	1.0
Maximum	10.0
Yellow	0.5
All-red	1.0
Walk	1.0
Clearance 1 and 2	1.0
Gap 1 and 2	0.5
Waste 1 and 2	2.0
Headway 1 and 2	0.2
Presence timers	0.5
Offset storage	2.0
Red arrow	1.0

Entering time settings in RAM

As this is only possible in RAM, the prefix is limited to TSR, followed by the appropriate suffix as described in the previous pages.

Data is entered in the format:

/ Delete the entry.

=! Enter zero.

=*x***!** Input the duration *x* in seconds. This value may be rounded by the computer for storage.

=C! Continuous signal (not valid for cycle length or phase).

=N! No signal required (not valid for cycle length).

Note: Yellow, all-red and pedestrian clearance values cannot be changed in controllers less than VC4.

VC4 (or later) controllers are capable of having yellow, all-red and clearance times changed. However, values for these items cannot be reduced below the value stored in EPROM for that item.

ERROR-DOB Value outside controller limits for item.

ERROR-NUM Value too big. SCATS Region cannot load a time setting greater than 340 seconds for any item.

ERROR-TBF Attempt to change protected memory location.

Example of entering time settings in RAM

The prefix TSR must be used to enter a time setting in RAM.

TSRAMA=70! Set A phase maximum to 70 seconds.

TSRBMA*7! Set B phase maximum to 70 seconds (PSF controller, using default multiplier).

TSRCG1/ Delete RAM time for C phase gap 1.

Updating RAM data at a site

Each controller connected via a telecom line to the SCATS Region may have data (i.e. time settings, Flexilink data) stored in RAM (random access memory). This data is not permanent and because of this, it is stored on disk in file **Sys.ram** at the regional computer.

Updating of the controller RAM data is normally automatically. However, if it is desired to manually start the update to a controller, enter:

n`!UD!`	Where *n* is the site. This command will also update the controller clock subject to the conditions described in the section 'Site clock time'.

Z flags

SCATS Region has six Z flags for each site. These are labelled Z1–Z6. Of these, Z3, Z5 and Z6 are reserved for SCATS Region's use. Z1, Z2 and Z4 can be set or cleared using keyboard commands, action lists or variation routines. The state of the Z flags can also be tested using variation routines.

`Z1!`	Sets the Z1 flag.
`Z2/`	Clears the Z2 flag.
`Z3!`	Reserved to request miscellaneous status flags from a VC4 or greater controller.
`Z5!`	Reserved for termination of special movements in Masterlink. Special movement on a phase is indicated with an `S` on phase clearance in the site data, e.g. `AT=4S!`
`Z6!`	Reserved to indicate that the controller is to send back signal group green status. Set by graphics or signal group strategic inputs.
`Z?`	Lists Z flags at the monitored site, e.g. `Z? 1234:1-2` shows that the Z1 and Z2 flags are on at site 1234.
`I=*!Z?`	Lists the Z flags that are on at all sites in the monitored region.

Detector input mapping

Detector input mapping is the mapping of physical detectors to logical detectors in the controller personality. This feature is only available with VC5 controllers and higher. Detector input mapping can be changed using the `IMAP` command if the `EI` region option or the `EI` site option is on.

There are two sections for the detector input mapping data. For VC5 controllers, section 1 has 32 entries and section 2 has 16 entries for a total of 48 entries. For VC6 controllers, section 1 has 56 entries and section 2 has 24 entries for a total of 80 entries.

In older versions of SCATS, the detector input mapping had a maximum of 32 entries. The detector input mapping could be changed using the `IMAP`*n* command, where *n* ranged from 1 to 32.

In current versions of SCATS, the command has been changed to allow for future expansion. It now includes a section number. The command format is now `IMAP`*x*`.`*y*, where *x* is the section number (1 or 2) and *y* is the entry number.

`IMAP`*n***`?`**	Lists detector input mapping in RAM for detector *n* at the monitored site, where *n* is 1 to 48.
`IMAP`*x***`.`***y***`?`**	Lists detector input mapping in RAM for entry *y* in section x at the monitored site, where *x* is 1 to 2, y is 1 to 32.
`IMAP*?`	Lists detector input mapping in RAM for all detectors at the monitored site that have a difference between the physical and logical inputs.
`IMAPX?`	Same as above.
`IMAPP`*n***`?`**	Lists detector input mapping in ROM for detector *n*, where *n* is 1 to 48.
`IMAPP`*x***`.`***y***`?`**	Lists detector input mapping in ROM for entry *y* in section x at the monitored site, where *x* is 1 or 2 and y is 1 to 32.
`IMAPP*?`	Lists detector input mapping in ROM for all detectors at the monitored site. This command may also be terminated by **`/`** or **`!`**.

IMAPPX?	Same as above.
IMAPSP?	Lists the SCATS copy of detector input mapping in ROM for all entries for the monitored site.
IMAPSP*?	Lists the SCATS copy of detector input mapping in ROM for all sites in the monitored region.
IMAPSR?	Lists detector input mapping in the SCATS copy of RAM for all detectors at the monitored site that have a difference between the physical and logical inputs.
IMAPSR*?	Lists detector input mapping in the SCATS copy of RAM for all detectors at all sites in the monitored region that have a difference between the physical and logical inputs.
IMAP*n***=[E]***x*,*y*!	Sets detector input mapping for detector n at the monitored site from physical detector x to logical detector y, where *x* and *y* are 1 to 32, z and w are 1 to 48.
IMAP*x*.*y*=*z*,*w*!	Sets detector input mapping for entry *y* in section x at the monitored site from physical input z to logical input w, where *x* and *y* are 1 to 32.
IMAP*n*/	Clears the detector input mapping for detector *n* by copying the entry in ROM to the entry in RAM, where n is 1 to 48.
IMAP*x*.*y*/	Clears the detector input mapping for entry *y* in section x at the monitored site by copying the entry in ROM to the entry in RAM, where *x* is 1 or 2 and y is 1 to 32.

Note that if the values of *z* and *w* in the command IMAP*x*.*y*=*z*,*w*! are the same as the corresponding ROM values, RAM data is set to 0 (no RAM data). This replicates the operation of a controller in respect to local time settings in that RAM data in a controller is RAM data that differs to ROM data.

Notes

Chapter 17: Flexilink data

Site RAM data backup

When you enter Flexilink data or controller timing data for a site, the settings are first sent to the site for validation. If validated, the site saves it in controller RAM, and then returns the setting to SCATS Region. SCATS Region then saves the setting in memory and also writes it to the file **Sys\Sys.ram**. This file reloads the SCATS Region memory if SCATS Region is restarted.

If the site is not communicating, the setting only goes to the SCATS Region memory and to file. It will be automatically downloaded to the site when communications is restored.

If RAM data is lost at the site, SCATS Region will reload the site RAM provided the site is communicating with SCATS Region.

Flexilink schedules

Entering schedules

Flexilink schedules specify when a particular Flexilink plan is to be introduced. Schedules (20 maximum) are entered by typing:

SC*n***>***d******hh***:***mm***=***p***!**

where:

n is the schedule number (1–20)

d is the day of the week code (1–15)

hh is the hour of day using 24-hour clock (00–23)

mm is the minute (00–59)

p is the plan number (0–10) to be introduced at the scheduled time

For example, `SC1>8*15:30=3!` selects plan 3 at 3:30 pm, Monday to Friday.

Listing Flexilink data

SC*? Lists all 20 schedules.

SC*n***?** Lists schedule *n*.

SC*n***/** Delete schedule *n* (i.e. set all data to zero).

CR? Lists all RAM time settings, including Flexilink schedules and plans.

FS? List all Flexilink plans and schedules.

FX? Lists active Flexilink plan and cycle generator step.

Copying schedules to another site

If several sites require identical schedules, enter one set of schedules at one of the sites. Then transfer the schedules to other sites with the command:

SC*C=*y***!** Copy all schedules from the current site to the nominated site *y*.

For example, to copy all schedules from the monitored site to site 123, enter `SC*C=123!`

Disabling schedules

Individual schedules can be disabled by entering 15 in the day code. If the first three schedules are:

```
SC1>8*6:30=4!
SC2>13*7:00=4!
SC3>8*10:00=3! etc.
```

then to disable schedule 2, enter:

```
SC2>15*7:00=4!
```

Deleting/ending Flexilink schedules

Entering all zeros in any schedule effectively deletes all subsequent schedules as a controller will not read data beyond a zero schedule, e.g.

SC5/ Makes all schedules greater than schedule 4 inoperative. Same as entering `SC5>0*0:0=0!`

SC1/ Makes all schedules inoperative.

Day-of-week code numbers

0 = End of schedules

1 = Sunday

2 = Monday

3 = Tuesday

4 = Wednesday

5 = Thursday

6 = Friday

7 = Saturday

8 = Monday–Friday

9 = Monday–Saturday

10 = Tuesday, Wednesday and Thursday

11 = Monday and Friday

12 = Monday, Friday and Saturday

13 = Saturday and Sunday

14 = Every day

15 = Never, i.e. a dummy value for schedules not in use

Flexilink plan data

There are 11 Flexilink plans, numbered from 0 to 10 for which you can enter data. The controller uses plan 12 as a transition plan when changing from one plan to another. It can be listed but not entered.

PD*n*? Lists all plan *n* data.

PD*? Lists all Flexilink plans (except plan 12).

Flexilink plan items can be entered or requested individually.

PD*n*CL=*x*! Cycle length for plan *n*. If `CL=0!` the site will run Flexilink-isolated on this plan.

PD*n*A=*x*! Cycle step at which A phase call is to occur. Similarly `PDnB?` to `PDnG?` for phases B to G.

PD*n*R-=*x*! Cycle step at which R- signal is to be set.

PD*n*R+=*x*! Cycle step at which R+ signal is to be set.

PD*n*Y-=*x*! Cycle step at which Y- signal is to be set. If `Y-=N!` the site will run Flexilink isolated on this plan.

PD*n*Y+=*x*! Cycle step at which Y+ signal is to be set.

PD*n*Z-=*x*! Cycle step at which Z- signal is to be set.

PD*n*Z+=*x*! Cycle step at which Z+ signal is to be set.

PD*n*Q-=*x*! Cycle step at which Q- signal is to be set.

PD*n*Q+=*x*! Cycle step at which Q+ signal is to be set (for controllers greater than VC0 only).

PD*n*SF=*list*! XSF signals for this plan, e.g. PD3SF=1-5,9,11!

Flexilink R, Y, Z and Q signals

The following responses are for R, Y, Z and Q signals only.

N Signal not set.

Note: Do not use 0 (zero), as 0 is a valid cycle step.

C Signal set continuously.

Flexilink-isolated mode

Y-=N! If Y-=N!, the Flexilink plan will be ignored as far as phase pulses are concerned and the site will run Flexilink isolated. This is the same result as having CL=0!.

However, regardless of Y-=N! or CL=0!, the special signals (Y+, Z-, Z+, Q-, Q+) and the XSF signals are not ignored, and may be used by the personality for other functions even when running Flexilink isolated.

Y-=C! Set Y-=C! (or Y-=*offset*! if controller is VC4 or greater) to enable the plan so that the site can run Flexilink on that plan, provided cycle length is not zero.

Flexilink cycle steps

Early controllers (VC0, 1 and 2) have Flexilink pulses only in 2-second steps. Later controllers (VC3 onwards) can have either 1-second steps or two-second steps, depending on the mode byte in the personality. You will need to check which type of step the controller needs before entering plan data.

For example, a 90-second cycle length would be specified as:

- 45 cycle steps on a controller less than VC3 with 2 seconds per cycle generator step
- 90 cycle steps on a VC3 or greater controller if it has 1-second cycle generator steps

Steps for phases and signals must be within the range of 0 to maximum cycle length step minus 1.

For example, if the cycle length is 45 steps, the allowable range is 0 to 44, where 0 is the 45th step.

Entering Flexilink plan data

PD*n*T! To enter Flexilink plan data for one plan, enter: PD*n*T! where *n* is a plan number from 0 to 10. The computer will respond with a question for each item required for the Flexilink plan.

Press the **Esc** key at any time to terminate the entry of plan data.

Individual items for a particular plan may be entered separately. The plan number must come first, followed by the item to be entered (or altered) with the new value. For example:

PD1CL=30! Cycle length on plan 1 is 30 steps.

PD1A=10! A phase is called on 10th cycle step in plan 1.

PD2B=20! B phase call sent at cycle step 20.

Note: Calls must be specified for each phase in the correct sequence

PD3R-=15! R- signal sent on 15th cycle step.

PD4Y-=C! Y- is continuous in plan 4.

PD5Z-=N! Z- is not used in plan 5.

Note: Use N, not 0 (zero) if signal is not required, as 0 is a valid cycle generator step.

Note: N is also valid for phases, but not for cycle length. If nothing is entered (e.g. PD3A=!) zero is the default.

Alternate Flexilink sequence (Y+)

The effect of the Y+ signal in Flexilink is programmable in a site's personality and its plan value can be set to any number between 0 and cycle length – 1.

However, it is generally reserved for the selection of the phase sequence in Flexilink.

`Y+=N!` selects normal sequence.

Note: `N` = No pulse whereas `Y+=0!` sets a Y+ at cycle generator step zero.

`Y+=C!` selects the alternate sequence (`C` = Continuous pulse).

Skipped phases in Flexilink

Calls for skipped phases must be specified in the plan data with dummy cycle step values in the same order as the running sequence.

It is usual to specify a call for a skipped phase one step before a phase that will run.

For example, if C phase is to be skipped, and D phase follows C:

```
PD1CL=60!PD1A=20!PD1B=40!PD1C=54!PD1D=55!...
```

Flexilink plan offset specification

Originally, Flexilink phase calls at each site reflected the desired offset between sites. This made it difficult to change offsets, as all phase calls in the plan data had to be recalculated for a new offset.

In VC4 or greater controllers, the pivot phase (i.e. the Flexilink equivalent of the stretch phase in Masterlink) in all plans can always start at cycle generator step zero, and the desired offset can be specified in Y-. This way, offsets can be easily changed, just by changing the Y- offset value.

Most other controllers also operate the same way as a VC4 (depends on software version running in the controller).

Some controllers still require `Y-=C!` with the phase calls reflecting the desired offset.

If in doubt, try a test plan using an offset in Y- and check if the call pulses are offset by that amount when running Flexilink.

Delta controller method of selecting a plan

If multiple plan changes are scheduled to occur at the same time then the schedule that takes priority is the one with the highest schedule number.

Example:

```
SC4>14*18:30=1!
SC5>5*18:30=3!
SC6>7*18:30=3!
```

The plan change is scheduled to occur at 06:30 in each of the above schedules. Plan 3 is selected on Thursdays (day 5), and also on Saturdays (day 7), and plan 1 is selected on all other days.

Chapter 18: Site alarms

One of the benefits of SCATS is its alarm reporting. Because SCATS communicates with every site each second, it can detect an alarm almost immediately.

Summary of alarms

The following table summarises all site alarms. The meaning of each column is listed below the table.

Code	Meaning	Severity	Masks	Masked by	Latched	DIDO	Midnight	Action
BD	Bad data	Major		None	Yes	No	Yes	*
BO	Blackout	Major	None	FY	No	Yes	Yes	+
CA	Clock alarm	Minor*	None	None	No	No	No	+
CE	Communications error	Minor	None	None	Yes	No	Yes	+
CF	Controller fault	Minor	None	None	No	Yes	Yes	
CK	Checksum	Major	None	None	No	Yes	Yes	+
DA	Detector alarm	Minor	None	PF ST WD	No	Yes	Yes	
DZ	Output interface	Major	None	None	No	No	Yes	+
FL	Forced fallback	Major	None	None	Yes	No	Yes	*
FY	Flashing yellow	Major	BO	None	No	Yes	Yes	*
GT	Green time	Major	None	None	No	Yes	Yes	*
GW	Green watchdog	Major	None	None	No	No	Yes	
IH	Inhibit	Warning	None	None	Yes	No	Yes	
IR	Invalid RAM	Major	None	None	No	Yes	Yes	+
IV	Invalid message	Minor	None	None	Yes	No	Yes	
LC	Long clearance	Warning	None	PF ST WD	Yes	No	Yes	
LF	Lamp fault	Warning	None	None	No	Yes	Yes	
NC	No carrier	Major	None	None	No	No	Yes	+
NF	New controller fault	Minor	None	None	No	Yes	Yes	
OD	Overdue message	Warning	None	PF ST WD	No	No	Yes	
PE	Phase error	Major	None	None	Yes	No	Yes	+
PF	Power failure	Major	DA LC OD SC UD	ST	No	Yes	Yes	+
PK	Parked	Minor	None	None	No	No	No	
SC	Short clearance	Warning	None	PF ST WD	Yes	No	Yes	

Code	Meaning	Severity	Masks	Masked by	Latched	DIDO	Midnight	Action
SF	Special facility	Major	None	None	No	Yes	Yes	
SI	Strategic input	Minor	None	None	No	No	Yes	
ST	Stopped talking	Major	DA LC OD PF SC UD	None	No	Yes	Yes	+
SY	Synchronising request	Minor	None	None	Yes	No	Yes	
UD	RAM update failure	Warning	None	PF ST WD	No	No	Yes	
VE	Validation error	Major*	None	None	No	No	No	*
WD	Watchdog	Major	DA LC OD SC UD	None	No	Yes	Yes	+
XU	External unit	Warning	None	None	No	Yes	Yes	

* The clock alarm (CA) and validation error (VE) alarms are treated differently to the rest of the alarms. These alarms are not shown in SCATS Region or SCATS Terminal. The validation error is shown as a major alarm in the SCATS Access **System Status Summary - Major Alarm** dialogue, but not in the **Region Graphics** dialogue or the ITS interface.

Code

This is a two-letter mnemonic that is used when the alarm is referred to in client software such as SCATS Access, SCATS Log, SCATS Alarm Analyser, SCATS Communications Analyser or SCATS Terminal.

Meaning

This is the meaning of the alarm code, *not* the meaning of the alarm.

Severity

This is the severity of the alarm. The severity may be major, warning or minor.

Masks

This is a list of any other alarms that will be masked by the current alarm. Masking only applies in SCATS Terminal unless noted otherwise.

Masked by

This is a list of any other alarms that will mask the current alarm. Masking only applies in SCATS Terminal unless noted otherwise.

Clearable

This specifies whether the alarm can be manually cleared.

Alarms can be latched or non-latched. If the alarm is latched, it can be cleared manually, but it will reappear if the condition causing the alarm has not been fixed.

DIDO

Whether a dial-up site reports this alarm when it occurs.

Midnight

Whether a dial-up site reports this alarm when it dials in to report its status at midnight.

Action

Report alarms marked * to an officer responsible for the immediate correction of the SCATS data. Report those marked + to an officer responsible for equipment repairs.

Alarm reference

The rest of this chapter describes each site alarm. Each alarm starts on a new page with a list of the alarm properties (as described in the summary of alarms above), followed by a number of sub-headings as described below.

Description

This provides a description of what the alarm means and why it occurs.

Effect on site

This provides a description of any impact that the alarm has on a traffic signal's operation on site.

Troubleshooting

This provides a summary of the possible causes of an alarm and the actions that should be taken to eliminate the cause.

Associated commands

This is a summary of any SCATS commands that can be used in a command line interface such as SCATS Terminal or SCATS Region when running as a console application. Most commands have an equivalent in SCATS Access.

BD alarm

Code: BD

Meaning: Bad data

Severity: Major

Masks: None

Masked by: None

Clearable: Yes

DIDO: No

Midnight Yes

Description

An error has been detected in the site's SCATS data.

Bad data alarms are produced when:

- syntactically correct but inconsistent data is entered
- incomplete information is detected
- adaptive changes result in data outside an optimum range, e.g. due to loss of detector data

The cause of a BD alarm is logged and can be viewed using SCATS Log.

Effect on site

If the site is running Masterlink, it is probably either uncoordinated if the running offset plan is not valid, e.g. `PP=0@!` or it may be stuck on a phase if the active split plan is illogical. For example, `A=0PDB!B=1A!` where the only phase that can run is A.

Variation routines 35 and 43 are disabled if a BD alarm is present.

Troubleshooting

Cause	Action
Plan data undefined.	Enter valid plan data, then enter `PL/` to load the new plan data into the active plan area (required even if the site is running isolated or Flexilink).
Illogical sequence in split plan, e.g. a phase going to itself.	Enter valid sequence then enter `PL/`
@ symbol present in split or offset plan data.	Enter valid data then enter `PL/`
`PX!` shows @ in the active plan while other plans are correct.	Enter `PL/` to reload the active plan.
`PP0?` shows @ while `L!` shows correct offset plan data.	Enter `PL/` to reload the active offset plan.
Invalid data in variation routines.	Correct variation routine data.
Stretch phase time is less than 5%.	Reduce time for minor phases.
An ISS subsystem has a strategic approach with an SD not pointing to the `VP1=35!` site.	Correct the SD data – all plan voting strategic approaches must have SDs specifying the site that has `VP1=35!`
There is more than one site in a subsystem with `VP1=35!`	Ensure each ISS subsystem has only one site with `VP1=35!` Check sites with `INT=0!` Use `SS=n!I?` to list the sites in the subsystem.

Note: After changing split or offset plan data, enter `PL/` to reload the active plans, as it is not automatically reloaded until the next plan change.

Associated commands

BD? Lists the cause of a bad data alarm at the monitored site as follows:

- PL0 indicates that the active split plan has faulty data, e.g. bad sequence or no next phase.
- PL0<> indicates that the stretch phase is too short, i.e. the sum of the minor phases is too big.
- PP0 indicates that offset plan 0 has faulty data, e.g. unknown offset plan phase.
- SLAVE/PP indicates that a slave site has an invalid reference in an offset plan, i.e. an unknown site, unknown phase or a site with COM=0!.
- VR n indicates that variation routine n has bad parameters.

The following subsystem BD alarms may also be shown:

- SA/SD indicates strategic approaches in a subsystem not all pointing to the critical site (i.e. the SD critical site number must be the same for all strategic approaches).
- ISS_SA indicates a prime ISS phase has no strategic approach to vote for it.

I=*!BD? Lists the cause of BD alarms at all sites in the monitored region, excluding parked sites and test sites.

AL/ Clears the BD alarm (and any other latched alarms) at the monitored site.

BO alarm

Code: BO
Meaning: Blackout
Severity: Major
Masks: None
Masked by: FY alarm
Clearable: No
DIDO: Yes
Midnight Yes

Description

The region has received a message from the controller that the lamps are blacked out.

Effect on site

Lamps probably off (or flashing yellow if provided).

Troubleshooting

Cause	Action
Facility switch off at housing.	Turn switch on.
Blown fuse to lamp supply.	Replace fuse.
Tripped circuit breaker to lamp supply.	Reset.
Lamp switch off in housing.	Turn switch on.
Faulty lamp monitoring relay (LAMR) at the site.	Repair or replace.
Fault in controller LAMR relay sensing circuit.	Repair – check wiring and plug. If no fault replace module.
LR present. No CK alarm present.	Enter `LS=ON!` for the site from a SCATS terminal OR press Alarm Cancel button at controller for ten seconds.
CK – Checksum fault.	See checksum (CK) alarm.

The controller should still function and will still communicate with the region which will ignore all detector information as far as cycle length and plan selection control are concerned. If this is the critical site in the subsystem it will affect all sites in that subsystem unless backup strategic input/strategic approach data is operating from other sites.

Associated commands

Nil.

CA alarm

Code: CA

Meaning: Clock alarm

Severity: Minor

Masks: None

Masked by: None

Clearable: No

DIDO: No

Midnight No

Description

A clock alarm occurs when a difference of more than three seconds is found between the controller software clock time and the regional computer time. When a discrepancy is found, the controller time is updated by SCATS Region. Clock alarms are only tested for and logged at midnight.

Clock alarms are not checked if:

- `RK=+CD!` This disables clock alarms on the region.

A difference of between 40 seconds or less will log as is.

If more than +/– 40 seconds, the difference is shown as '**' .

SCATS updates the controller clocks if:

- It's a new day (i.e. midnight).
- PC time changes by more than 5 seconds.
- It's a 10-minute period and the controller time differs from the region time by more than 3 seconds.

Effect on site

If the site is running Flexilink it will be out of coordination with adjacent sites running Flexilink.

Troubleshooting

Cause	Action
Software clock in controller is out of synchronisation with software clock in regional computer.	Replace card containing clock at controller.
Wrong VC number in site data.	Check the VC number. Use `CID?` to list the controller ID.

If the clock in the regional computer is altered, each controller will optionally have its software clock updated within the next minute.

Associated commands

`MC?` Gets the time from the controller's clock.

`UD!` Updates the RAM data and the time in the controller's clock.

`UF?` Gets the subsystem fallback status.

`RK=+CD!` This disables clock alarms on the region.

CE alarm

Code: CE

Meaning: Communications error

Severity: Minor

Masks: None

Masked by: None

Clearable: Yes

DIDO: No

Midnight Yes

Description

A CE alarm is generated whenever the site CE alarm counter reaches 10. This counter is incremented on detection of either a CE or SY alarm and is decremented each minute. If the counter reaches 10 on a CE alarm, a CE alarm will be generated and latched.

A CE alarm represents a serious repeating communications fault.

Effect on site

The site is unaffected. SCATS messages are retried after a CE alarm.

Troubleshooting

Cause	Action
Noisy communications line.	Have fault repaired.
Faulty modem at either the site or the region.	Replace.
Faulty communications processor at the site.	Replace.
Faulty DZ in the region.	Replace.

A communications error is detected by the DZ interface or the SCATS software. The following faults can be distinguished:

Associated commands

`CE?` Gets the cause of the CE alarm as follows:

- FE = Framing error. The serial interface (UART) in the regional computer did not receive a valid stop bit in a message sent by the controller.
- HP = Hardware parity. The total number of bits set in the character received by the regional computer is even instead of odd.
- OF = Opcode failure. The regional computer received a message it could not understand.
- OR = Overrun. The serial interface (UART) in the regional computer received a character from the site, but the computer had not yet accepted the previous character. This previous character will be overwritten and lost. This results in loss of message synchronisation and will produce an SY alarm and, depending on the importance of the lost character (i.e. first character of a message), may produce an invalid message (IV), overdue message (OD) and/or stopped talking (ST) alarm.
- PR = Software parity. The parity check for a complete message sent by the site to the regional computer is even instead of odd.

`I=*!CE?` Gets the cause of CE alarms at all sites in the current region.

CF alarm

Code: CF

Meaning: Controller fault

Severity: Minor

Masks: None

Masked by: NF in SCATS Terminal, SCATS Access **Alarms** button and SCATS Access **Alarms** dialogue

Clearable: No

DIDO: Yes

Midnight Yes

Description

The controller has an entry in its log.

Effect on site

The controller state depends on the fault that produced the log entry. For example, a major fault such as a conflict or a watchdog may make the controller lamp display go to flashing yellow.

Associated commands

LGC! Compare the data in the controller log with the data in the SCATS Region file **Faultlog.dat**.

LGS! Save the controller log in the SCATS Region file **Faultlog.dat**, replacing any previously saved data.

LG? List the errors and faults in the controller log.

LGE/ Clear the errors in the controller log.

LGF/ Clear the faults in the controller log.

LG*/ Clear both the errors and faults in the controller log.

CK alarm

Code: CK

Meaning: Checksum

Severity: Major

Masks: None

Masked by: None

Clearable: No

DIDO: Yes

Midnight Yes

Description

When a controller is connected to SCATS, the checksum of all pages of EPROM memory is manually obtained with the command SU=*! and is entered in the site data block in the **Sys.lx** file using the CS=*n*! command. The regional computer obtains this checksum of the same EPROMs from each controller every minute and compares this total with the value stored in CS.

If there is a difference, SCATS asks for the checksum again, and if wrong the second time, a CK alarm occurs. By default, the regional computer will send an LR signal, resulting in a CKBO or a CKFY alarm.

If RK=+NB!, the BO or FY can be disabled on a CK if RK contains NB.

The CK alarm will remain while the two values differ but will disappear if a correct value is returned, leaving the BO or FY alarm.

If RK=+FY!, an FY alarm will be logged as a BO alarm.

Effect on site

Site will be blacked out (or flashing yellow if provided). See BO alarm or FY alarm.

Troubleshooting

Cause	Action
Faulty EPROM.	Obtain the checksum of individual EPROMs and compare with the checksum table for the controller until the faulty EPROM is found. Replace EPROM and obtain total checksum with the SU=*! command to verify with the CS value in the site data.
Data lines to two sites have been crossed.	Arrange for lines to be uncrossed.
Checksum in site data has been changed to a value that differs to the total checksum of the site.	If the site data checksum is the wrong figure obtain the correct checksum with SU=*! and enter this in site data.
A new personality or timing EPROM has been installed.	If it was intended to install a new EPROM the checksum value in the site data (CS) has to be updated. If the checksums of the new EPROMs are known obtain the individual checksums for these EPROMs via a SCATS terminal and compare with the known values. If correct update the checksum in the site data – if incorrect replace the faulty EPROMs.

Associated commands

CS? Lists the checksum.

CS=*nnn*! Sets the checksum to *nnn* (in octal).

CS=$*hh***!** Sets the checksum to *hh* (in hexadecimal).

SU=*! Lists the checksum.

DA alarm

Code: DA

Meaning: Detector alarm

Severity: Minor

Masks: None

Masked by: PF, ST and WD alarms

Clearable: No

DIDO: Yes

Midnight Yes

Description

If a pedestrian push button stays activated or a vehicle detector does not change state between successive check detectors messages from a regional computer, the controller will place a software 'short circuit' on the vehicle detector (but not on a push-button detector), flag the detector as faulty and inform the regional computer to produce a DA alarm.

If the faulty detector changes state, the local will remove the short circuit immediately (vehicle detector only) but will not inform the master until either the next check detectors message or either a `DF?` or `DF/` command.

The standard periods for automatic check detectors messages are:

- all days 20:00 to 08:00 of the following day
- Monday to Friday 08:00 then every hour until 20:00
- Saturday 08:00 then every 2 hours until 20:00
- Sunday 08:00 then every 4 hours until 20:00

Some controllers can automatically detect and report a detector alarm without any intervention from SCATS.

The VC4 or greater controller permits each detector to be allocated to a site-specific detector alarm category. Category zero detectors are still checked for alarms on receipt of the SCATS TDA message. Non-zero category detectors have their alarm check period set in the site personality and will report a DA when it occurs.

Detector alarm categories

Later controllers have their own detector alarm checking periods in the personality. When a controller detects its own detector alarm, it will send the DA details to SCATS immediately, and it will also send when it clears.

A detector alarm cannot be removed by SCATS. If communications are lost with the SCATS Region, the controller will still maintain the software short circuit until the detector changes state either by being repaired or by manual actuation of the detector switch on the controller.

If the time is within the detector alarm period, a check detector request (TDA) will be sent:

- on the hour on Monday to Friday
- on the even hour on Saturday
- on every hour divisible by 4 on Sunday

Effect on site

When a vehicle detector is flagged faulty by the controller (producing a DA alarm), the detector will place a permanent demand for its phase and extend that phase to maximum regardless of the operating mode.

A pedestrian push button that produces a DA alarm will call its pedestrian features every cycle.

Troubleshooting

Cause	Action

Cause	Action
Vehicle detector is inoperative.	Repair detector.
Loop is open circuit.	Cut new loop.
Detector switch on controller is either short circuit or off.	Put switch in normal position.
Unused detector has not been disarmed in personality.	Disarm detector in personality.
Faulty detector input isolation card.	Replace or repair.
Push button stuck on.	Repair.
Rarely used lane.	Disarm detector.
Vehicle continually parked on loop.	Remove vehicle (police action/surveillance).
Intermittent operation of detector.	Repair detector.
Intermittent operation due to faulty wiring or connections.	Check/repair.
Power supply to detector unit is faulty.	Repair/replace.
Oscillating detector on VC4 or greater controller.	Repair detector (retune).

Associated commands

DF?	List the faulty detectors.
VD?	Use VD? on printer to determine if detector is short circuit or open circuit.
DAC*?	List the RAM or EPROM alarm categories for all vehicle detectors.
DACP*?	List the EPROM alarm categories for all vehicle detectors.
DAC*n***?**	List the category for vehicle detector 'n'.
DAC*n***/**	Clear RAM category for vehicle detector 'n'.
DAC*n***=***m***!**	Change RAM category for vehicle detector 'n'.
PAC*?	List the RAM or EPROM alarm categories for all pedestrian push-button detectors.
PACP*?	List the EPROM alarm categories for all push-button detectors.
PAC*n***?**	List the category for push-button detector 'n'.
PAC*n***/**	Clear RAM category for push-button detector 'n'.
PAC*n***=***m***!**	Change RAM category for push-button detector 'n'.
DAP=*hh***:***mm***-***hh***:***mm***!**	Defines the period for detector alarm checking. Enter time in 24-hour format. Minutes will be rounded to the nearest 15-minute value.
DAP?	List the detector alarm period.
DF?	Lists faulty detectors at the monitored site.

DZ alarm

Code: DZ

Meaning: Output interface*

Severity: Major

Masks: None

Masked by: None

Clearable: See description

DIDO: No

Midnight Yes

* DZ is derived from DZ11, which is the name of an 8-port asynchronous multiplexer that was used for serial communications in the days when SCATS Region ran on a Digital Equipment Corporation PDP11.

Description

SCATS Region was unable to transmit any data or a site is allocated to a serial port for which no hardware is installed.

Effect on site

Site will go to fallback mode.

See DZS and DZT commands for test procedures.

Troubleshooting

Cause	Action
Faulty hardware in the SCATS Region.	Repair/replace.
Faulty driver	

Associated commands

AL/ Clear alarm

FL alarm

Code: FL

Meaning: Forced fallback

Severity: Major

Masks: None

Masked by: None

Clearable: Yes

DIDO: No

Midnight Yes

Description

The site has been forced to fallback mode by an associated alarm.

Note that an FL alarm can only be cleared with AL/, which will also return all subsystems in the marriage tree to Masterlink.

The command UF! will not unlock fallback caused by FL!

Effect on site

The site will be running fallback.

Troubleshooting

Cause	Action
Controller remained in startup for 60 seconds or more, causing IH and FL alarms.	Determine reason for controller remaining in startup for so long and correct it.
Controller returned a green watchdog, causing GW and FL alarms.	See description of GW alarm.
Invalid phase sequence was requested, causing BD and FL alarms.	Correct the phase sequence in the split plan.
Invalid phase was requested, causing PE and FL alarms.	See description of PE alarm.
Phase termination was longer than expected, causing LC and FL alarms.	See description of LC alarm.
Slave site used a call phase that did not exist at the master site, causing BD and FL alarms.	Correct the call phase or the master site number, as appropriate.
Slave site used an unknown site as the master site, causing BD and FL alarms.	Correct the master site number.

Associated commands

AL/ Note that an FL alarm can only be cleared with AL/. This also returns all subsystems in the marriage tree to Masterlink and clears the fallback counters in VC5.1 controllers.

UF! Unlock fallback caused by FL!

FY alarm

Code: FY

Meaning: Flashing yellow

Severity: Major

Masks: BO alarm

Masked by: None

Clearable: No

DIDO: Yes

Midnight Yes

Description

The SCATS Region has received a message from the controller that the lamps are flashing yellow. Note that for a controller less than VC4, an FY must be notified by the controller for two consecutive seconds before SCATS logs an FY alarm.

The controller should still function and will still communicate with the region which will ignore all detector information as far as cycle length and plan selection control are concerned. If this is the critical site in the subsystem it will affect all sites in that subsystem unless backup strategic input/strategic approach data is operating from other sites.

A site can be manually sent to flashing yellow with the `LS=FY!` command.

If your controllers don't have a flashing yellow facility, but SCATS occasionally reports an FY alarm, use:

If FY region option is on, an FY alarm will be logged as a BO alarm.

Effect on site

Lamps probably flashing yellow.

Troubleshooting

Cause	Action
Facility switch at housing on flashing yellow position.	Set switch to normal setting.
Faulty LAMR relay.	Repair or replace.
Fault in controller LAMR relay sensing circuit.	Repair – check wiring and plug. If no fault replace module.
LR present. No CK alarm present.	Enter `LS=ON!` for the site from a SCATS terminal or press the alarm cancel button at the controller for ten seconds.
Checksum fault.	See checksum alarm, CK alarm.

Associated commands

`LS=FY!` Change lamps to flashing yellow.

`RK=+FY!` Turn on the FY region option so that FY alarms are logged as BO alarms.

GT alarm

Code: GT

Meaning: Green time

Severity: Major

Masks: None

Masked by: None

Clearable: No

DIDO: Yes

Midnight Yes

Description

A site running Masterlink has been displaying the same green for more than 250 seconds.

Effect on site

Site not cycling.

Troubleshooting

Cause	Action
Site is dwelled.	Remove dwell.
Invalid phase sequence.	Fix personality.
Fault in personality.	Fix personality.
Site in manual mode.	Use an MSS bit in personality in conjunction with a variation routine to force the site to isolated mode.

Associated commands

Nil.

GW alarm

Code: GW

Meaning: Green watchdog

Severity: Major

Masks: None

Masked by: None

Clearable: No

DIDO: No

Midnight Yes

Description

A site reports a GW alarm when a phase green time has exceeded a preset value in the controller and the limit green watchdog timer expired.

This value would normally be about 250 seconds. The limit green watchdog timer is reset at the beginning of each phase introduction or if NXP=0 under no demand conditions.

If a phase is currently dwelled, SCATS sends a reset limit green watchdog timer message to the controller every 60 seconds.

`RGW!` sends a reset green watchdog request to the controller. If the controller initialises its green watchdog timer, the GW alarm will disappear.

Effect on site

The site is probably not cycling.

A GW alarm also causes an FL alarm and the site is forced to fallback mode.

GW alarms only occur in Masterlink mode.

Troubleshooting

Cause	Action
Green watchdog timer value is too small.	Increase the green watchdog timer value in the timing EPROM or in RAM.
Invalid phase sequence.	Fix personality.
Fault in personality.	Fix personality.

Associated commands

`RGW!` Send a reset green watchdog request to the controller.

`AL/` Use `AL/` to clear the FL alarm.

IH alarm

Code: IH

Meaning: Inhibit

Severity: Warning

Masks: None

Masked by: None

Clearable: Yes

DIDO: No

Midnight Yes

Description

The controller Terminate Inhibit flag was on for 2 consecutive seconds when the phase maximum was issued from SCATS Region.

The controller terminate inhibit flag was on for 2 consecutive seconds when the phase maximum was due from the master and the phase had not moved off rest. For a site to get an IH alarm, the phase has to have been running for sixteen seconds or longer. The terminate inhibit flag is on during: late start, phase or signal group minimum, walk in delay or walk, special movement timer period, early cut-off green, yellow or all-red intervals.

Stuck controllers

For VC=0 sites where the phase termination is not sent until the controller inhibit flag goes off, the following occurs in case the controller is stuck.

If the phase green time reaches 60 seconds or more and the SCATS remaining phase time reaches -30 seconds or less (i.e. more negative) an IH alarm is generated and the LC alarm timer is loaded. If the controller remains stuck, an LC then an FL alarm will be generated.

Effect on site

The site is probably not running the phase splits as specified, as one of the phases could not be terminated when its maximum signal was due. In SCATS, if a phase runs longer than its calculated time, the lost time will be taken from the following phase(s), if possible, until SCATS gets the site back in step. It is also possible for the site to be stuck on a phase, as a phase cannot be terminated while the controller has its terminate inhibit flag set. If the inhibit flag is set so as to prevent phase termination for more than six seconds, an LC alarm will occur (see LC alarm).

Troubleshooting

Cause	Action
Late start plus minimum green for phase is 15 seconds or longer.	Reduce total to less than 15 seconds.
Special movement timer, e.g. following a protected walk.	Have personality modified to accept a Z5 signal to suppress special movement. This also requires the inclusion of an S in the phase intergreen in the **Sys.Ix** data, e.g. AT=5S!
Walk unknown to the SCATS Region.	Modify personality and/or **Sys.Ix** data so that the master is aware of and terminates walk correctly (not for a secret walk).
Uncontrolled walk reintroduction.	Modify personality to allow the reintroduction only when the next phase (NXP) is zero.
Minimum walk time in controller exceeds 14 seconds.	Reduce minimum walk in controller to less than 15 seconds. Note that walk time in site data can exceed 14 seconds.

Cause	Action
Communications problems.	Rectify.

Variation routine 41 can be used to extend the IH protection period to more than 15 seconds.

Note that a phase cannot be terminated when the terminate-inhibit flag is set.

Testing for an IH alarm will be disabled for 30 seconds after a change of mode at the controller (i.e. isolated to Masterlink) to allow any walks or special movement timers to expire.

Use the IH alarm store to determine the state of a site at the time an IH alarm occurred.

If the IH store contains data, it is retained until viewed. If the IH store is empty or it contains data that has been viewed, new data will be automatically saved.

Associated commands

IHS? List the IH message store to view the state of the site. For example:

```
26-MAR-2008 17:00:46 Int 805: Mlink (for 117 secs) - IH at 20 secs in C
    In C GRN (A next), local IH ON at 1 for 20 secs
    Call sent, MX=9, AL=0, CET=0
    Demands:AB - Groups:5,9
    WALKS - Active:3 (0 ready for termination)
            Terminated:3-4 - Clearing:0
```

IHS/ Clears the IH store. (This is not usually necessary.)

IR alarm

Code: IR

Meaning: Invalid RAM

Severity: Major

Masks: None

Masked by: None

Clearable: No

DIDO: Yes

Midnight Yes

Description

The local controller has sent a message to the SCATS Region indicating that its RAM data is invalid. When a controller is first powered up, its RAM data will be zeroed and the data will be flagged invalid. After the SCATS Region has successfully sent the master copy of the RAM data to the controller, the controller flags its RAM data as valid. If this data changes for any reason, other than by a message from the SCATS Region, the controller will declare the RAM data invalid.

SCATS won't log an IR alarm while a RAM update is in progress unless the IR region option is on.

Effect on site

If the site was running isolated or Masterlink, it will be running local times from EPROM instead of any times that may have been entered in RAM. If the site was running Flexilink, it will now be running isolated.

Troubleshooting

Cause	Action
RAM data lost when power to controller turned off.	No action – SCATS Region will update RAM when power /communications are restored.
PTF controller only – 'RAM DATA VALID' LED is off.	Press 'RAM MONITOR' button – if LED does not light – possible hardware fault.
RAM zeroed but SCATS Region unable to update.	See UD alarm.
Faulty RAM.	Replace.

A controller with a standby battery supply will not lose its RAM when power is removed from the controller. When power is restored, the controller checks that the RAM data is valid and that the Flexilink clock is still calibrated. If both the RAM and clock are valid, the controller will not set its invalid RAM (IR) flag and hence will not request an update.

When a controller has an IR alarm, it will not use RAM time settings or Flexilink data; the controller therefore is unable to operate on Flexilink.

Associated commands

`UD!` Update controller RAM and clock – clock will not be updated if subsystem is on fallback or if region has a TIM alarm.

`UD/` It clears the controller RAM. Then sends the defined RAM items, Flexilink plans and schedules to controller. This is the only way to clear any erroneous data entries in controller RAM.

`RK=IR!` SCATS won’t log an IR alarm while a RAM update is in progress (see `UD!` command in the CONTROLLER RAM UPDATE section.) unless `RK=+IR!`

IV alarm

Code: IV
Meaning: Invalid message
Severity: Minor
Masks: None
Masked by: None
Clearable: Yes
DIDO: No
Midnight Yes

Description

The site has received a message it cannot understand.

If the cause of the IV alarm cannot be easily found, use `IVS?`

If the IV store contains data, it is retained until viewed. If the IV store is empty or it contains data that has been viewed, an IV message will be automatically saved.

Effect on site

Unaffected.

Troubleshooting

Cause	Action
Faulty communications processor at site.	Replace.
Faulty DZ in SCATS Region.	Replace.
Old background software in controller.	Update.
Wrong VC number in site data.	Check controller software version with `CID?` and update the VC number in the site data if necessary.

Associated commands

`IVS?` List the contents of the IV message store.

`IVS/` Clears the IV store.

LC alarm

Code: LC

Meaning: Long clearance

Severity: Warning

Masks: None

Masked by: PF, ST and WD alarms

Clearable: Yes

DIDO: No

Midnight Yes

Description

A long clearance alarm occurs when a controller is more than six seconds overdue in returning the green time from a phase to which it has been instructed to go. If no green time has been returned after a further ten seconds, an FL alarm is produced, and the site will go to fallback.

Effect on site

Specified phase length for the phase during which the alarm occurs is being exceeded by at least six seconds and possibly up to 15 seconds if no FL alarm is present. If FL alarm is present, phase length is being exceeded by sixteen seconds or more.

- When a phase runs over time, SCATS reduces the time of the next phase(s) to get back into step.
- If an FL alarm is present, see FL alarm.
- If an IH alarm is present, see IH alarm.
- Testing for a long clearance alarm will be disabled for 30 seconds after a change of mode at the controller (i.e. Masterlink to Flexilink) to allow any walk clearances to expire.

Warning: VR21 will mask out an LC alarm. This may prevent a stuck site being forced to fallback (FL alarm), as an LC must occur first.

You can view the state of a site at the point where an LC alarm was detected using the LCS command.

If the LC store contains data, it is retained until viewed. If the LC store is empty or it contains data that has been viewed, new data will be automatically saved.

Troubleshooting

Cause	Action
Phase clearance in site data is more than 6 seconds below that being used by the controller.	Use TSC to list local times for phase during which the LC alarm occurs, e.g. `TSCB*?` for B phase. Compare E.G. + YE + RE times with the clearance time in the site data (e.g. BT) and correct site data if necessary.
Walk clearance time in site data is more than 6 seconds below that being used by the controller for that walk.	Use TSC to list local times for the walk that causes the LC alarm, e.g. `TSCP2*?` for walk 2. Calculate the clearance needed for the walk compare with the time in the site data and correct the site data if necessary.
Incorrect polarity walk termination signal set in site data for a walk (VC<4 only). Use PE? to check if a walk is running. This usually causes an FL alarm as well as the controller will stick in the phase.	Use correct polarity signal in site data to terminate walk. Note that VC4 or greater controllers no longer have walk polarity.
A walk is specified in the site data as a walk overlap but in the personality it is specified as a clearance overlap. This will cause an FL alarm as in 3) above.	Change site data so that walk is specified as a clearance overlap.

Cause	Action
Inhibit flag set.	See IH alarm.

Associated commands

LCS? List state of the site when an LC alarm was detected.

LCS/ Clears the LC store.

LF alarm

Code: LF

Meaning: Lamp fault

Severity: Warning

Masks: None

Masked by: None

Clearable: No

DIDO: Yes

Midnight Yes

Description

The controller is sending a signal that at least one of its lamps is faulty.

Lamp fault logging

The signal group number, colour and number of lamp faults will be logged for up to 10 signal groups.

A count of 7 means 6 or more lamps are faulty.

Effect on site

One or more lamps have blown.

Troubleshooting

Cause	Action
At least one of the bulbs at the site is blown.	Replace blown bulbs. Clear fault.
Lanterns not installed.	Install.
Lantern socket used to obtain power for an external supply, e.g. a drill.	Clear fault in RAM.

Associated commands

LA? List all sites that have an LF alarm.

LF? Lists all faulty lamps by signal group colour.

LW*n*? Lists the present lamp wattage/normal lamp wattage for each colour for signal group number *n*.

LV? List the lamp voltage and the mains voltage.

NC alarm

Code: NC

Meaning: No carrier

Severity: Major

Masks: None

Masked by: None

Clearable: See description

DIDO: No

Midnight Yes

Description

The communications interface in the regional computer is unable to detect a carrier signal from the controller. The NC alarm clears immediately a carrier is detected.

AL/ will clear an NC fault.

Effect on site

Unaffected unless an ST or PF alarm is present. If due to a power failure, the site will be blacked out.

Note that a site that has not communicated since SCATS was started will have an NC PF alarm.

Troubleshooting

Cause	Action
Line between site and regional computer is faulty – open circuit or short circuit.	Have line repaired.
Faulty isolation transformer at either site or region.	Replace isolation transformer.
Faulty modem at region or site.	Replace modem.
Faulty DZ carrier detection in regional computer.	Replace DZ.
Faulty modem rack at region.	Repair or replace modem rack.
Link open between communications line and isolation transformer at site.	Connect links.
Dry joint in isolation transformer rack at region.	Resolder joints.
Fault in isolation block (Krone block) at region.	Repair or replace.
Fault in wiring between telecom line and modem rack.	Repair wiring.
Controller switched off.	Switch controller on.
Power supply failure at controller.	Rectify.
Mains failure at controller.	Notify appropriate electricity supply authority.
Fault in mains supply, e.g. loose fuse, loose connection, moisture etc.	Rectify.

Associated commands

AL/ Clear alarm

NF alarm

Code: NF

Meaning: New fault

Severity: Minor

Masks: CF in SCATS Terminal, SCATS Access **Alarms** button and SCATS Access **Alarms** dialogue

Masked by: None

Clearable: No

DIDO: Yes

Midnight Yes

Description

A new entry has been added to the controller log. This is applicable to VC4 or higher controllers only.

Effect on site

See CF alarm.

Troubleshooting

Cause	Action
Controller specific.	See the controller log manual from the controller manufacturer for details in decoding the hexadecimal controller log codes.

Associated commands

LGC! Compare the data in the controller log with the data in the SCATS Region file **Faultlog.dat**.

LGS! Save the controller log in the SCATS Region file **Faultlog.dat**, replacing any previously saved data.

LG? List the errors and faults in the controller log.

LGE/ Clear the errors in the controller log.

LGF/ Clear the faults in the controller log.

LG*/ Clear both the errors and faults in the controller log.

OD alarm

Code: OD

Meaning: Overdue message

Severity: Warning

Masks: None

Masked by: PF, ST and WD alarms

Clearable: See description

DIDO: No

Midnight Yes

Description

The regional computer has sent a high priority message and has not received a reply from the controller within 4 seconds.

Overdue messages are retried and clear automatically on receipt of a reply to all overdue messages.

Overdue messages are trapped in the OD store, which can be listed to find which message is causing the OD alarm.

If the OD store contains data, it is retained until viewed. If the OD store is empty or it contains data that has been viewed, new data will be automatically saved.

Octal bit pattern	Message	Description
1	–	
2	–	
4	RSW	Reset watchdog
10	–	
20	–	
40	SCT	Set clock time
100	–	
200	–	
400	SSF	Set special facilities
1000	BVO	Begin volume and occupancy
2000	FVO	Finish volume and occupancy
4000	TDA	Toggle detector alarms
10000	–	
20000	–	
40000	–	
100000	–	
200000	RFV	Read five-minute volumes
400000	SXF	Set extra special facilities
1000000	–	
2000000	–	
4000000	–	
10000000	–	

Octal bit pattern	Message	Description
20000000	–	
40000000	DIM	Dimming

NXP is excluded, as an overdue NXP causes an ST alarm.

Effect on site

Unaffected.

Troubleshooting

Cause	Action
Faulty DZ in SCATS Region.	Replace.
Faulty communications processor at site.	Replace.
Incompatible controller software.	Update.

Associated commands

ODS? List the messages in the OD store.

ODS/ Clear the OD store.

PE alarm

Code: PE

Meaning: Phase error

Severity: Major

Masks: None

Masked by: None

Clearable: Yes

DIDO: No

Midnight Yes

Description

The controller has reported that it is running an unknown phase (larger than the site dimensioned phases).

SCATS logs the phase that caused the PE alarm.

Effect on site

Forced to fallback.

Troubleshooting

Cause	Action
Bad communications.	See CE alarm.
Incorrectly dimensioned slot.	Re-dimension the slot.

A PE alarm will cause a BD alarm and an FL alarm.

A PE alarm is the result of two consecutive wrong phase messages (the first wrong message is discarded in case it was caused by bad communications).

A new phase message is also discarded if the controller was not terminating the previous phase in the last second unless two consecutive new phase messages are received.

Associated commands

Nil.

PF alarm

Code: PF

Meaning: Power failure

Severity: Major

Masks: DA, LC, OD, SC and UD alarms

Masked by: ST alarm

Clearable: No

DIDO: Yes

Midnight Yes

Description

Power failure. A PF alarm is generated if:

- no communications have been received from a site since the SCATS computer was rebooted
- the controller reports a power failure

Effect on site

The power is probably off.

Troubleshooting

Cause	Action
Power off at controller	

Note that the PF alarm is set for each site on start up of the SCATS traffic program and also when a site is given a subsystem number for the first time.

Associated commands

Nil.

PK alarm

Code: PK

Meaning: Parked

Severity: Minor

Masks: None

Masked by: None

Clearable: No

DIDO: No

Midnight No

Description

This is not an alarm. When present, it indicates that alarms for this site are parked.

Alarms from a site that has its alarms parked are not included in any alarm summaries produced by SCATS and can be filtered out by alarm reporting applications such as SCATS Log.

Note that PK=/ will print a new site status record.

Effect on site

See specific alarm if any alarm other than PK is displayed on alarms line of VDU.

Troubleshooting

Cause	Action
PK=! in site data.	To remove park enter PK=/

Associated commands

PK=/ Clear parked status.

SC alarm

Code: SC

Meaning: Short clearance

Severity: Warning

Masks: None

Masked by: PF, ST and WD alarms

Clearable: Yes

DIDO: No

Midnight Yes

Description

A short clearance alarm occurs when a controller reports that it is in a new phase more than three seconds sooner than expected by SCATS Region.

The state of a site at the point where an SC alarm was detected is automatically saved and can be viewed for detailed analysis of the cause of the alarm.

If the SC store contains data, it is retained until viewed. If the SC store is empty or it contains data that has been viewed, new data will be automatically saved.

Effect on site

Phase time is shorter than that specified by the split plan.

Troubleshooting

Cause	Action
Phase intergreen specified in the site data is more than three seconds greater than that used by the controller.	Set SCATS intergreen to the total of ECG+YEL+RED as used by the controller. (obtain using TSC*!).
Walk clearance specified in the site data is more than three seconds longer than that used by the controller.	Set SCATS data to agree with the clearance time used by the controller.
The controller has either a walk or clearance overlap walk feature but is not specified as such in the SCATS site data.	Enter correct specification for the overlap.

Testing for a short clearance alarm will be disabled for 30 seconds after a change of mode at the controller (i.e. Masterlink to Flexilink) to allow any overlap walks to time off.

SCATS tests for an SC alarm when it receives a new phase message from the controller. Sometimes, CE alarms can simulate a new phase message, which can produce a false SC alarm. As a result, a new phase message is discarded if the controller was not terminating the previous phase in the last second unless 2 consecutive new phase messages are received.

Associated commands

SCS? List state of the site when an SC alarm was detected.

SCS/ Clear the SC store.

SF alarm

Code: SF

Meaning: Special facility

Severity: Major

Masks: None

Masked by: None

Clearable: No

DIDO: Yes

Midnight Yes

Description

An SF alarm is reported by a controller that uses any of the XSF flags 1 to 3 for specialised purposes such as controlling a sign position and that sign has not locked correctly in its position resulting in the corresponding MSS flags 1 to 3 not equalling the appropriate XSF flag 1 to 3.

Effect on site

The site is probably unaffected, but any special feature controlled by XSF flags 1 to 3 may not be operative.

Troubleshooting

Cause	Action
Controller specific.	Check XSF function at controller.

Associated commands

MSF? List the extra special facility flags and miscellaneous status flags 1–3.

MSS? List the miscellaneous status flags.

XSF? List the extra special facility flags.

SI alarm

Code: SI

Meaning: Strategic input

Severity: Minor

Masks: None

Masked by: None

Clearable: No

DIDO: No

Midnight Yes

Description

A strategic input or SI alarm occurs when one or more detectors from a strategic input fail to comply with the specified limits for updating. Updating occurs Monday to Friday at midnight or a detector has a DA alarm.

An MF update will only occur at cycle lengths above LCL.

Strategic input update limits

The following limits apply:

- 0.5*AvSp > space > 4*AvSpace
- 1.50 < HW < 5.00 seconds (average headway) (i.e. MF=720-2400)
- volume > 5 vehicles (in one green)
- CL > LCL
- HW<= best HW for the day, initially set to HW' of (3 x MF HW) / 2

Effect on site

A fault with either a detector or the SCATS data must be rectified. If no fault can be found, the detector should be removed from the strategic input specification as no updating may produce unpredictable plan and cycle length selection. An SI alarm will clear when valid data is received for the flagged detector.

A manual lock on an MF in a strategic input will prohibit an update for that lane and will also prevent an SI alarm for that lane. If an SI alarm is present for a detector with a locked MF, `DF?` will clear it.

Strategic input updating does not occur if cycle length is at LCL.

A lane with an SI alarm is flagged in the strategic input data block with a + preceding its MF data, e.g. `MF?` 1043,+1029!

Troubleshooting

Cause	Action
See causes for detector alarms, DA alarm.	
Wrongly specified phase or signal group in strategic input.	Correct the data.
Wrongly specified detector in strategic input.	Correct the data.
Detector specified in more than one strategic input for the site.	Ensure that detectors are not duplicated in any strategic inputs for the site.
Detector oscillating.	Repair detector.
Detector sticking on or giving short outputs.	Repair detector.
Only half the loop working.	Repair loop.
Long green time with little volume.	Remove detector from strategic input.

Cause	Action
DA alarm.	Repair detector or loop.
Cycle timer never exceeds minimum.	

Associated commands

DF? A strategic input alarm at a site can be listed by using DF?

ST alarm

Code: ST

Meaning: Stopped talking

Severity: Major

Masks: DA, LC, OD, PF, SC and UD alarms

Masked by: None

Clearable: See description

DIDO: Yes

Midnight Yes

Description

The controller has stopped talking.

An ST alarm is generated if a status update message has not been received from the controller for eight seconds.

An ST alarm indicates a serious communications fault.

Effect on site

When an ST alarm occurs, the site is sent to fallback mode for two minutes (each site has its own 2-minute fallback timer).

Troubleshooting

Cause	Action
Overdue NXP message.	See OD alarm.
Wrong VC number in site.	Check the VC number – correct as necessary (use `CID?` to obtain controller ID if still communicating).
DZ test is active or DZS has not been removed.	Use `DZS?` to list sites that have had normal SCATS communications stopped (perhaps in preparation for a DZ test). Use `DZS/` to restore normal communications.

Associated commands

`CET?` Lists the communications error timer.

`CET/` Clears the communications error timer.

SY alarm

Code: SY

Meaning: Synchronising request

Severity: Minor

Masks: None

Masked by: None

Clearable: Yes

DIDO: No

Midnight Yes

Description

This is the site equivalent of the regional computer CE alarm, in that the site has detected an error in a message sent to it by SCATS, e.g. parity error. The site cannot send the specific fault detected, but sends an RSY (request synchronising character) instead.

An RSY from the controller causes SCATS to reply with a resynchronising message and a retry of the message that caused the RSY at the controller.

Effect on site

The site is unaffected.

Troubleshooting

Cause	Action
Faulty hardware in SCATS Region.	Replace.
Faulty communications processor at site.	Replace.
Faulty modem(s).	Replace.
Noisy line.	Have fault repaired.
Wrong VC number in site.	Check VC number and change if necessary.

Associated commands

Nil.

UD alarm

Code: UD

Meaning: RAM update failure

Severity: Warning

Masks: None

Masked by: PF, ST and WD alarms

Clearable: No

DIDO: No

Midnight Yes

Description

The SCATS Region was unsuccessful in updating the RAM data in the controller. The site usually has a UD and IR alarm.

Effect on site

Probably unaffected. If an invalid RAM (IR) alarm is also present, see IR alarm.

Troubleshooting

Cause	Action
Faulty RAM or RAM not initialised.	See IR alarm.
Faulty data in the SCATS Region master copy.	If controller RAM still has the data (see CR? or CRC!), use ZD! to delete all data from disk, then enter CRS! to upload the data from the site RAM.
Data on disk for unknown phase or time setting at the site.	Delete the setting (e.g. TSRALS/) OR if the controller objects, use method described in 2) OR using a text editor, create a temporary file that has the site number and the deletion command in it then read the file under DSK> mode – this will modify **Sys.ram** directly without the command having to go through the controller.
Communications problems.	Rectify.

Associated commands

Nil.

VE alarm

Code: VE

Meaning: Validation error

Severity: Minor

Masks: None

Masked by: None

Clearable: No

DIDO: No

Midnight No

Description

When SCATS Region first starts communicating with a site (e.g. when a site is first turned on or communications are regained after a communications failure), it tests controller type, checksum and site number. If any of these are wrong, a VE alarm is generated. If any of these things are changed by a user, they are revalidated. If the revalidation fails, SCATS Region makes up to three further attempts to revalidate the site on one-minute boundaries.

Note: Testing of the site number only occurs if the **VI – validate personality site number** region option is selected.

The problem has to be fixed before the VE alarm goes away.

Note: The Remarks column in SCATS Access Alarm Manager dialogue will tell you the cause of the VE alarm, i.e. "VC number", "Checksum error" or "???". If the remark says "Unknown state", it indicates that the controller did not respond with any or all of the required info, possibly due to a timeout or some other fault.

SCATS Region will not download any RAM data to the controller or automatically change the lamp state while there is a VE alarm.

Effect on site

The site may be blacked out or flashing yellow.

Troubleshooting

Cause	Action
Wrong controller type	Replace controller
Wrong personality in controller	Replace personality
Wrong site due to crossed communications line	Fix communications line
Wrong checksum in SCATS	Correct checksum in SCATS
Wrong site number in SCATS	Correct site number in SCATS
Wrong controller type in SCATS	Correct the controller type in SCATS

Associated commands

VE! Forces a revalidation.

VE/ Clears the validation error retry counter.

WD alarm

Code: WD

Meaning: Watchdog

Severity: Major

Masks: DA, LC, OD, SC and UD alarms

Masked by: None

Clearable: No

DIDO: Yes

Midnight Yes

Description

There has been a failure in the controller's CPU or memory or the personality has a fault, e.g. green to red. In a Delta, a controller checksum fault produces a WD alarm.

If not prohibited by `RK=NW!`, SCATS will attempt to reset a watchdog once only, when the WD alarm first occurs.

`AL/` allows SCATS to automatically send a reset watchdog provided RK does not include NW (no automatic watchdog reset).

`RSW!` Send a reset watchdog request to any controller with a WD alarm, provided `RK=NW!` (No Watchdog reset) is not specified.

Note: A WD alarm is a serious controller fault and should be reset with caution.

Effect on site

Site will black out (or flashing yellow, if provided).

Troubleshooting

Cause	Action
Failure of CPU.	Replace CPU.
Program memory failure.	Replace.
Personality memory failure.	Replace.
Timing memory failure.	Replace.
Personality fault.	Rectify and replace.

Delta and PTF controllers have local diagnostic error code facilities. See the appropriate controller instruction manual for details.

Associated commands

`AL/` Allows SCATS to automatically send a reset watchdog provided RK does not include NW (no automatic watchdog reset).

`RSW!` Send a reset watchdog request to any controller with a WD alarm, provided `RK=NW!` (No Watchdog reset) is not specified.

`RK=NW!`

XU alarm

Code: XU
Meaning: External unit
Severity: Warning
Masks: None
Masked by: None
Clearable: No
DIDO: Yes
Midnight Yes

Description

The controller is reporting a fault in an external unit, such as a lamp monitoring unit (LMU) or an ANTTS interrogator.

Effect on site

Unaffected.

Troubleshooting

Cause	Action
Faulty lamp monitoring unit.	Replace.
Faulty ANTTS interrogator.	Replace.
Old controller software.	Update.
Controller door open.	Close controller door.

Associated commands

`XID?` List ID of external device(s).

`RK=DX!` Disable XU alarms at sites with VC<4.

Alarm logging

Every time the SCATS Region detects an alarm going on or off, it writes an event to its event log. It also forwards this information to the SCATS Central Manager and the SCATS Central Manager updates the database and writes an event to its event log. In this way, the SCATS Region's event log keeps a history of site alarms going on and off within its region, the SCATS Central Manager's event log keeps a history of alarms going on and off for all regions and the SCATS Central Manager database stores the current state of an alarm.

When the SCATS Region and SCATS Central Manager write a site alarm event to their event logs, it is written as a site status record. This contains the following information:

- Date
- Time
- Source of the alarm (i.e. SCATS Region name or 'SCMS' for SCATS Central Manager)
- Site number
- Active split plan and active offset plan and whether they are locked
- Any special facility flags that were on
- Operating mode
- Current phase, phase interval and next phase (if known)

- Various flags indicating whether the operating mode was locked, the site was on fallback, the site was running fixed-time, the site was congested or the site was dwelled, the offset plan was using low or high offsets, the offset plan was using static or dynamic offsets
- The state of all site alarms (by comparing this with the previous site status record, you can determine which alarms have changed state, hence which alarms went on and which alarms went off)
- The state of detector alarms for vehicle detectors and pedestrian push-buttons
- The degree of any clock error
- Cycle length
- Optional data related to clock alarm (CA), validation error (VE) and special facility (SF) alarms

When an alarm is cleared using a SCATS command, or the equivalent of that command in SCATS Access, an event is written to the SCATS Region event log and forwarded to the SCATS Central Manager (as above).

When an alarm is acknowledged, hidden, shown or cleared using SCATS Access, an event is written to the SCATS Central Manager event log. These are not sent to the SCATS Region, as the SCATS Region has no support for these concepts.

The event logs can be viewed using SCATS Log.

Listing alarms

For sites that do not have their alarms parked. (i.e. have PK=/, not PK=! in their site data):

AL? List all alarms excluding DA, SI and LF alarms.

DA? List all DA and SI alarms.

LA? List all sites with lamp faults (LF alarms).

MA? List all sites with major alarms (BD, BO, CK, DZ, FL, FY, GT, GW, IR, NC, PE, PF, SF, ST, SY, UD, WD). Lists subsystems that have a non-backup plan voting strategic approach whose strategic input measured a green but has not produced degree of saturation for the last three cycles during the increment failure-checking period. This signifies a potential problem relating to the selection of adequate phase splits for that approach. See also RK=FM!

BD? List the cause of a bad data alarm at the monitored site.

For all sites including those with parked alarms:

DF? List faulty detectors and strategic input faults at the monitored site.

DF/ Send TDA message – a site will produce a DA alarm for each detector that has not changed state between successive TDA messages. TDA messages are sent automatically by SCATS – refer to DA alarm for the intervals between TDA messages.

Parking alarms

PK=! Stops listing of all alarms from the monitored site. (AL? DA? and MA? will not show any alarms for a parked site, even if it is blacked out.)

PK=/ Allows alarms from the monitored site to be listed Note that PK=/ will print a new site status message.

PK? List all sites that have their alarms parked.

Cancelling alarms

AL/ Cancels latched alarms for the monitored site as described below.

I=*!AL/ Cancels latched alarms for all sites.

AL/ clears the BD, CE, FL, IH, IV, LC, PE, SC and SY alarms and resets the single-shot automatic watchdog feature.

If the site is not running Masterlink, AL/ clears the next phase (NXP) message being sent to the controller.

If the phase is not terminating, AL/ clears flags for:

- call sent
- call acknowledged

If the site is not VC4 or higher, the walk termination P- and P+ signals are cleared and an automatic watchdog reset is enabled.

A new special facilities message is sent to the site.

The alarm display on all monitoring terminals is updated.

A site status message is printed on any connected logging printer if any latched alarms were cleared.

A new message is sent to the map port (if defined).

No site status messages are logged unless a latched alarm was cleared. For example, if a site only has a BO alarm, AL/ cannot clear the alarm and hence no event is logged as a consequence of entering AL/.

Scheduling AL/

An AL/ can be scheduled from an action list.

Test sites

Test sites do not require a SCATS security key to change data. This allows a controller to be connected to SCATS as a test site and to be used for testing either SCATS features or site personalities without the need for the security required for real sites.

By default, test sites do not log any alarms.

TI?	Lists the range of test site numbers, e.g. TI? 20000-64999.
RK=+TI!	Log alarms for test sites if not parked.

The starting number for "test" sites is set with the SCATS Region Configuration program.

Maintenance interrupt mode

Sites running maintenance interrupt mode do not show any alarms on a workstation display. However, NC, FY, PK, ST, BO and WD alarms are shown in the event log.

Dial-up sites

Dial-up sites, identified by COM=DI! or COM=DO! in the site data, generate alarms only when communicating (after CON! is entered while monitoring, or when SCATS dials them).

Some alarms will be cleared when communications are terminated, e.g. after CON/ is entered while monitoring.

Fallback due to alarms

Subsystem fallback

When a stopped talking (ST) alarm occurs, the site goes to fallback and stays on fallback until two minutes after the ST alarm clears.

If a site with a forced fallback (FL), power failure (PF) or stopped talking (ST) alarm has a link mode that includes ^ (e.g. LM=MF^!), a subsystem 15-minute fallback-pending timer is started. This timer is decremented each minute and becomes inactive when it reaches zero.

If a second or subsequent alarm occurs (or if the same alarm is still present) after more than two minutes but less than fifteen minutes from the initial alarm, the subsystem is forced to fallback for 30 minutes and all subsystems in the marriage chain (subject to SK=BF!) are forced to fallback for the same period.

A repeat of this process due to alarms from any sites in the marriage chain (subject to SK=BF!) resets the fallback period to thirty minutes. When the period expires, the subsystems revert to Masterlink operation.

Fallback on strategic approach failure

When an FY, BO or WD alarm occurs at a site all strategic input data is cleared because the results would be unreliable, as the site no longer has lamp control of the traffic flow. Because of this, the strategic input degree of saturation values will be zero.

If the subsystem SK includes SA, any cycle controlling strategic approach that has had no average degree of saturation (averaged over 3 cycles) for the last 3 cycles (a total of 5 cycles of DS=0), will generate an increment failure, which results in adding one to the subsystem cyclic increment fail counter.

If the increment failure counter reaches 4, an INF alarm is generated at the subsystem if the time is within the increment failure-checking period (IFP).

If a subsystem has an INF alarm and its SK includes IF, the subsystem will set its fallback timer to 30 minutes if it does not have a cycle length, subsystem plan and link plan lock. This results in all sites in the subsystem being forced to run their fallback mode. Fallback will also be passed through the marriage, subject to SK=BF! If fallback is active, the fallback counter will be decremented each minute. If the fallback timer drops to 27 and the fallback condition is still present, the timer is reset to 30 minutes. When the timer reaches zero, the subsystem will revert to Masterlink mode.

Use SAF? to list strategic approaches that have failed.

See RK=FM! if you want strategic approaches failures to show as major alarms.

Controller clock updates

Each controller clock is normally updated by SCATS every whole ten minutes. However, sites that have been forced to go to their fallback mode because of a subsystem fallback will not be sent a clock update until the subsystem comes off fallback.

As fallback is usually caused by a site losing communications with SCATS, synchronisation would be lost between the site that is not communicating and those that are, if the remaining sites received clock updates while the clock at the non-communicating site drifted relative to SCATS time.

Resetting subsystem fallback

To override (and reset) the subsystem fallback timer, enter:

UF!	Unlocks fallback for the subsystem to which the monitored site belongs, as well as all systems in the marriage chain.
UF?	Lists the fallback time (in minutes) – a negative value means fallback is pending.
SS=*n*!UF!	Unlocks fallback for subsystem 'n' as well as well as all systems in the marriage chain.
SS=*!UF!	Unlocks fallback at all subsystems.
AL/	If a site or its subsystem is on fallback due to an FL alarm (refer to FL alarm), UF! will not unlock fallback. Use AL/ on the site that has the FL alarm! Note: Find the cause of the FL alarm to prevent a recurrence.

A site will remain on fallback until its two-minute immediate fallback timer has expired regardless of UF! or AL/.

SY command

SY? Lists those subsystems that have:

- Fallback: Subsystems that have been forced to fallback mode.
- Increment failure: Subsystems that have had no strategic approach produce an required cycle length for the last five cycles between, e.g. no operating detectors on any strategic approaches due to a black out in the area.
- SK=IF: If SK includes IF, the subsystem will go to fallback if it has an increment failed alarm. If SK does not include IF, a low cycle length 'Warning' is produced for graphics display.
- High density: Subsystem has cycle length>=XCL, RL>=XCL-5, and VK/VO>=2.4 on any strategic approach lane with AV > 2000, i.e. red graphics status.

FBK, INF and HID commands

FBK? List those subsystems on fallback.

INF? List those subsystem with incremented failed.

HID? List those subsystems with high density.

Increment failure-checking period

IFP=*hh*:*mm*-*hh*:*mm*!** Changes the increment failure-checking period. Enter the time in 24-hour format. Minutes are rounded to the nearest 15-minute value.

IFP? Lists the increment failure-checking period.

If the start and finish times are identical, IFP is disabled, e.g. `IFP=07:00-07:00!`

Use 24:00 for midnight, e.g. `IFP=00:00-24:00!`

This period is used for every day of the week. If necessary, use a scheduled action list to change the period for weekends.

Chapter 19: Warnings and error messages

Use the Windows® Event Viewer (**Start** > **Programs** > **Administrative Tools (Common)** > **Event Viewer**), to view any alarms generated during the SCATS Region system start-up. When in the viewer, be sure to select **Log, Application** to access the SCATS Region events.

Keyboard command error codes

ERROR-BSY Function busy, e.g.

- disk file open, e.g. **Sys.det**
- attempt to log on while an LX update is in progress
- attempt to change non-zero ODS, IDM, IHS, IVS

ERROR-CMP When RAM data is entered via the keyboard, the controller echoes the entered value for comparison. If data echoed does not agree with data entered, it produces a CMP error. This is normally due to a software fault in the controller.

ERROR-COM Command not valid for the COM type.

ERROR-DOB Controller RAM data out-of-bounds.

ERROR-FIL Error accessing file.

ERROR-I/O Controller input output error – ST alarm or no DZ interface found.

ERROR-ILL Illegal command.

ERROR-INH System startup inhibited. Date and time must be set before the system can be started.

ERROR-IVI Controller invalid instruction.

ERROR-KEY Insufficient access level for this command.

ERROR-LCK System locked data cannot be changed.

ERROR-LIC Incorrect licence information.

ERROR-NUM Illegal number in command.

ERROR-PHS Illegal phase specified.

ERROR-PSW Incorrect password.

ERROR-PTR Data pointer not set (illegal site, subsystem number etc.).

ERROR-SYN Syntax error – command format incorrect.

ERROR-TBF Controller time buffer full.

ERROR-VC Command not valid for the version of the controller.

Communications error messages

ERROR-BD S/B xx WAS yy – (bad data)

ERROR-BR baud rate error

ERROR-BSY SCATS Region communications are still active – stop with DZS=*n* !

ERROR-FE framing error

ERROR-HP hardware parity error

ERROR-I/O Unable to transmit test message – no hardware installed or faulty hardware.

ERROR-OR overrun

ERROR-SY receiver failed to synchronise on test pattern

ERROR-TO receiver did not get complete test pattern – timed out

Chapter 20: Files

SCATS folders

See SCATS Central Manager user manual and SCATS Region user manual.

SCATS files

See SCATS Central Manager user manual and SCATS Region user manual.

Saving your data

SCATS Region automatically saves data changes to the **Sys.lx** file approximately 5 minutes after the last data change if a user is logged on or when all users are logged off.

If you want to save data without having to log off, enter `SAVE!` and SCATS Region will immediately create a new **Sys.lx** file. Note that the current **Sys.lx** will be renamed to **Sys.lxb** before saving the data to a new file.

Disk file commands

`DSK` Obtain the disk prompt `DSK>`

Once the `DSK` prompt is displayed, you can enter the following commands:

`/RAM` Create the text file **Ram.txt** from the binary Flexilink data and time settings maintained by SCATS Region.

*`file`***`/RD`** Read commands from the specified file.

Press **Ctrl**+**Z** to exit from `DSK` mode.

An alternative is to enter the complete command inline by including the characters `DSK` followed by a space, e.g. `DSK` *`file`*`/RD`. In this way, a **Ctrl**+**Z** is not required to return to the SCATS prompt, as this happens automatically.

Copying files to/from SCATS Region

When using the SCATS Terminal program to monitor SCATS Region, you can use the `DSK` command to copy files between SCATS Region and your workstation. Use `PC::` if the file source or destination is your workstation. Omit the `PC::` if the file source or destination is the SCATS regional computer. The general format is:

`DSK` *`source destination`*

The source and destination can include the path. If omitted, the path will default to either the SCATS Region's **ScatsData\Sys** folder (if `PC::` is omitted) or the folder where the SCATS Terminal program exists if `PC::` is included. For example:

```
DSK ..\Sys\Sys.tc PC::
```

copies the SCATS Region's **Sys.tc** file from the SCATS regional computer to the folder from which the SCATS Terminal program was started.

While the copy is in progress, the letters `TFR` are shown on the SCATS Terminal status line to show that a file transfer is in progress. You must wait until the transfer finishes before you can use your workstation.

You can append the characters `/UP` which specifies that the file copy is only to be done if the source file has a later date/time than the destination file (if it already exists). If no destination file exists, the copy will always be done.

Note: You only need to use this method if you cannot access the files with Windows® Explorer, Windows® remote desktop services, a Citrix® service or similar.

Special functions

The following commands are not disk commands and cannot be entered under DSK> mode. However, they relate to disk functions.

When the /RD command is used to read the contents of a file, and a data error is encountered during the read, the error will be listed on the terminal from which the /RD was entered, and SCATS Region will wait for either a continue command or an abort command.

While in this mode, the normal SCATS prompt will be replaced by an underscore followed by a period (_.)

CO! Continue read of disk after error. If an error occurs during a read, the system drops out of DSK> mode. Entering CO! continues the read under DSK> mode.

KL! Kill or abort read. This is valid only after a file read error has occurred.

Note that the faulty data that caused the read error may be corrected manually from the keyboard and CO! entered to continue the read.

DSK data transfers

Local data transfers are done in DSK mode. The command format is either:

- **DSK** *output=input*
- **DSK** *input output*

Transferring data to a PC

DSK *source destination*

- If *source* or *destination* is preceded by PC:: it refers to your SCATS Terminal workstation. If this is the case and you do not specify a path, the folder where the SCATS Terminal source code exists is assumed. Otherwise you can enter a path after the PC:: code.
- If the source or destination does not include PC:: the SCATS Region computer is assumed. If this is the case and no path is entered. The **ScatsData\Sys** folder is assumed. If you supply a folder, then the **ScatsData** folder is assumed. Otherwise, you can specify the full drive and path.

/switches is the optional switches, where the switches may be:

/IM means image transfer of binary file (PC only).

/VAR means transfers a variable length record binary file, preceding each record with a byte count. Transferring to a PC, a byte count is added to the front of each record. Transferring from a PC, the byte count is removed.

/UP means update only if the file is out-of-date.

Chapter 21: Testing communications

Test procedures

The controller must be prevented from responding to the test messages sent by the computer before these tests can be conducted, e.g. isolation plug in Krone block, or pull plug at controller.

The following test procedures can only be done from a SCATS terminal. To start a test, you need a modem monitor card (MMC) or an RX/TX card capable of looping the signal back to the SCATS Region computer for comparison with the test pattern sent from the computer.

Starting a test

To conduct a test at a site, follow these steps:

DZS=*n***!**	Stop normal SCATS Region communications for the nominated serial port.
DZT=*n***!**	Start the communications test on the nominated serial port. Press the **Esc** key to exit from the test.
DZS=*n***/**	Restore normal communications to the nominated serial port.
DZS?	List the serial ports that have had their communications stopped.

The computer does one pass through the test pattern approximately every 12 seconds. Transmission rate is continuous. When a test is in operation, the terminal cannot be used for anything else. There is no limit to the length of time a test can be conducted.

*****	An asterisk is printed at the terminal at the end of each successful pass.
N	The letter N will be displayed instead an asterisk if the communications test was successful, but no carrier tone was detected by the modem.

Error codes

See chapter on warnings and error messages.

Test points

Test points are:

- computer
- modem rack
- Krone block
- isolation transformer
- controller

Test procedures

Tests at a region

Test in computer – insert an isolation plug in the krone block to isolate the site from the SCATS Region computer. Loop the signal at the RX/TX card in the modem rack. This may be done with the loop switch on the card, otherwise install an RX/TX card that has been specially modified to loop the signal.

Start the test. A communications error here shows a faulty host card, communications panel (Digi or Specialix) or RX/TX card. Replace the RX/TX with a known good card. If the fault remains, it is a faulty host card or coms panel, so inform the person responsible for computer hardware.

Tests at the site

Before conducting tests at the site, all tests at the region end must be completed first and they must prove negative.

As tests at a site require the controller to be isolated from the SCATS Region computer, and tests can only be done from a SCATS terminal, the test conditions must be set up at the site and a terminal used from another location, e.g. regional terminal or a nearby site.

Modem card test

If the region tests prove negative, remove the communications processor from the controller and reconnect the communications plug. Install an RX/TX card specially modified to loop the audio signal.

Start the test.

A communications error here shows a faulty module or power supply. Test the power supply. If faulty, replace, then retest. If the power supply is good, replace the module then retest. If no fault is found in any tests to here, and the site still has a communications problem, change the communications processor. If fault still persists, inform officer in charge of region.

Glossary

Term	Meaning
alarm	Fault at a site, reported by SCATS.
BD	Abbreviation of bad data.
BO	Abbreviation of blackout.
cableless link	Coordination of isolated controllers by using a synchronous clock. Not to be confused with SCATS Flexilink fallback mode.
CE	Abbreviation of communications error.
CF	Abbreviation of controller fault
CK	Abbreviation of checksum.
CMS	Abbreviation of Central Monitoring System (as used on a VAX).
controller	Traffic signal controller located at a site.
cycle length	The total time to complete all phases in a cycle.
cycle	All phases available in the active plan.
DA	Abbreviation of detector alarm.
degree of saturation	The average occupancy time of a lane detector at a site.
DET file	Text file containing detector information (SCATS 5 only).
detector	Individual sensing loops are placed in each traffic lane approximately one metre before the stop line to detect when a car is waiting for a phase to begin.
divorce	A divorce is when two adjacent sites are not linked.
dot prompt	The prompt indicating the SCATS regional computer will interpret commands is a dot.
DS	Abbreviation of degree of saturation.
fixed-time	A non-adaptive method of Masterlink operation whereby scheduled events can select any combination of split plan, offset plan and cycle length to override the normal Masterlink adaptive mode. See fixed-time plan.
FL	Abbreviation of forced fallback
Flexilink data	Time of day plans and schedules stored in a controller.
Flexilink	A SCATS mode of operation which uses a library of plans and time of day schedules stored in a controller personality.
FTP	Abbreviation of fixed-time plan.
FY	Abbreviation of flashing yellow.
graphics	Graphical display of site, subsystem or regional information.
GT	Abbreviation of green time.
GW	Abbreviation of green watchdog.
HCL	Abbreviation of high cycle length, now called maximum cycle length.
maximum cycle length	The maximum cycle length used, usually for peak traffic periods.
IDM	Abbreviation of intersection diagnostic monitor, which is an obsolete term for site diagnostic monitor.

Term	Meaning
IH	Abbreviation of inhibit.
incremental split selection	A mode of modifying the active split plan automatically from a set of pre-defined tables.
intersection diagnostic monitor	Tracing site alarms can be very time consuming. SCATS Region allows operation data for one site per region to be automatically collected and viewed at a later time.
IR	Abbreviation of invalid RAM.
isolated	SCATS fallback mode – vehicle actuated (VA).
ISS	Abbreviation of incremental split selection.
IV	Abbreviation of invalid message.
LC	Abbreviation of long clearance.
LCL	Abbreviation of low cycle length, now known as minimum cycle length.
LF	Abbreviation of lamp fault.
link	Specifies detectors and volume basis used in link voting, i.e. marriage and divorce.
link mode	The link mode or LM specification determines the normal and fallback operating mode of the site. Abbreviation: LM.
link plan	Plan used to specify offsets between adjacent subsystems.
link plans 1–4	The link offsets between subsystems, i.e. external offsets.
LK	Abbreviation of link.
LM	Abbreviation of link mode.
minimum cycle length	The minimum cycle length used, usually for the overnight minimal traffic period. Abbreviation: LCL.
LP	Abbreviation of link plan.
map file	Text file containing site and controller information.
marriage	A marriage is when two adjacent sites are linked.
Master-isolated	SCATS operating mode similar to Masterlink in that all phase lengths are calculated from the active split plan and cycle length but the PP point is ignored meaning the stretch phase does not have time added or subtracted to maintain coordination.
Masterlink	Full SCATS adaptive operating mode.
NC	Abbreviation of no carrier.
NF	Abbreviation of new fault.
OD	Abbreviation of overdue message.
offset plan	Plan for selecting offsets between sites within one subsystem.
PE	Abbreviation of phase error.
PF	Abbreviation of power failure.
phase	A period in a cycle during which several non-conflicting movements may run. The phases available are fixed in the controller personality.
PK	Abbreviation of parked.
PP	Abbreviation of progression plan.
progression plan	An obsolete term for offset plan.
progression speed	Parameter of 2 cycle lengths used to alter link offsets.

Term	Meaning
PS	Abbreviation of progression speed.
RAM	Abbreviation of random access memory.
RCC	Abbreviation of regional control computer (same as SCATS regional computer).
region	A conceptual geographic area controlled by a SCATS regional computer.
Region	The software hosted by a regional computer.
regional computer	The computer that controls the traffic signal sites in a region.
RPC	Abbreviation of route pre-emption control.
SA	Abbreviation of strategic approach.
SC	Abbreviation of short clearance.
SCATS Access	Graphical user interface for SCATS.
SCATS Terminal	Command line interface for SCATS.
SCATS	Abbreviation of Sydney Coordinated Adaptive Traffic System.
SCL	Abbreviation of stopper cycle length, now called alternate minimum cycle length.
SF	Abbreviation of special facility.
SGRAPH	Program that draws the graphical displays for SCATS.
SI	Abbreviation of strategic input.
SK	Abbreviation of subsystem key, now called subsystem option.
SM	Abbreviation of strategic monitor.
split plan	Plan used to specify the percentages for each phase that runs in the cycle.
SS	Abbreviation of subsystem.
ST	Abbreviation of stopped talking.
alternate minimum cycle length	Specifies two alternate minimum cycle lengths above the minimum cycle length and below maximum cycle length. Abbreviation: SCL.
strategic approach	Strategic approaches optionally control split plan selection and cycle length control for a subsystem.
strategic input	Strategic inputs group from 1 to 4 detectors at a site that are strategically important for subsystem plan and link plan selection.
strategic monitor	Traffic information relevant to the performance of a subsystem can be monitored with a strategic monitor. Abbreviation: SM.
subsystem option	Options that may be set for a subsystem, e.g. fallback, cycle length and linking strategies. Abbreviation: SK.
subsystem	Subsystems are groups of sites combined because of proximity, and when common cycle lengths will give optimum two-way progression.
SY	Abbreviation of synchronising.
synchronous link	Obsolete term for cableless link.
system monitor	Same as strategic monitor.
TC file	A file containing action lists read by schedule.
TC	Abbreviation of time control.
TCS	Abbreviation of traffic control signal.
TCS number	Unique identifying number for each site.

Term	Meaning
time control	A schedule of times at which specified events will be performed.
traffic control principals	Coordination of traffic signals along a route requires: ■ common cycle length at the sites ■ relative proportions for each phase, i.e. split plans ■ relative timing between phases at adjacent sites, i.e. offset plans
UD	Abbreviation of RAM update.
variation parameter	Parameters set for a site to specify variation routines to be used. Abbreviation: VP.
variation routine	Special routines that can be specified at each site, usually testing for special conditions, then applying specific actions to enhance or improve the traffic control. Abbreviation: VR
VAX	A type of Digital Equipment Corporation computer. The name is derived from Virtual Address eXtension.
VF	Abbreviation of volume flow.
volume flow	Volume parameter used to select cycle lengths between minimum cycle length and alternate minimum 1 cycle length. Abbreviation: VF.
voting	Sites vote on selection of link plan, split plan and marriage/divorce decisions.
VP	Abbreviation of variation parameter.
VR	Abbreviation of variation routine.
VS	Abbreviation of volume store.
WD	Abbreviation of watchdog.
XU	Abbreviation of external unit.