Practice Note 8.2.1 — Application of Market Phases and Algorithm

Issue Date	Cross Reference	Enquiries
17 February 2012, amended on 15 April 2013.	Rules 8.2.1–8.2.3	Please contact Securities Market Control:— Email: securities.mc@sgx.com

1 Introduction

1.1 This Practice Note explains the application of the various market phases and the algorithm used by SGX-ST in computing the single price for the Opening Routine, Closing Routine and Adjust Phase.

1.2 Rule 8.2.1 says the trading hours and the application of the market phases are as published by SGX-ST.

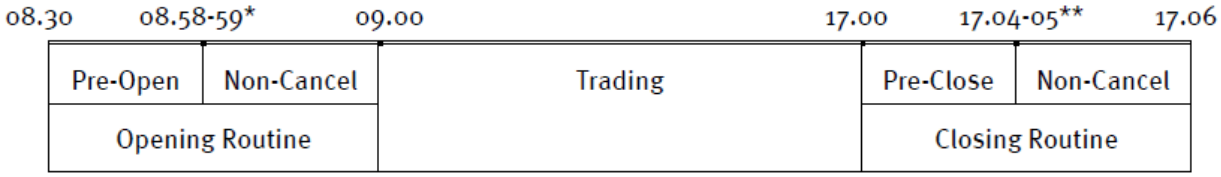
1.3 Rule 8.2.2 says SGX-ST may vary the trading hours and application of the market phases.

1.4 Rule 8.2.3 sets out the various market phases.

2 Application of Market Phases

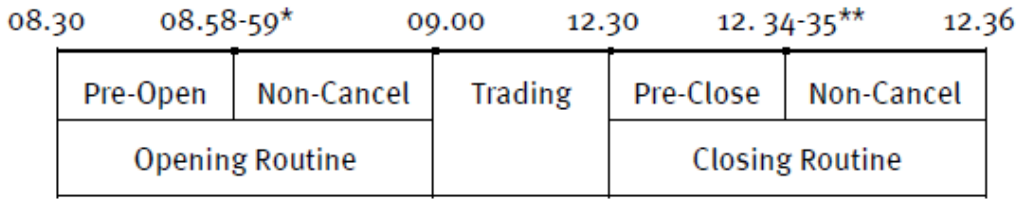
2.1 Summary of Market Phases

(1) Normal Day Trading



* Please see Point 2.2(2) and (3).
** Please see Point 2.5(3) and (4)

(2) Half-Day Trading



* Please see Point 2.2(2) and (3).
** Please see Point 2.5(3) and (4)

2.2 Opening Routine

(1) The Opening Routine is a 30-minute session before normal trading starts at 09:00 hours. It comprises the Pre-Open Phase and the Non-Cancel Phase.

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(2) Pre-Open Phase (08:30 to 08:58–59 hours)

(a) Orders can be entered, reduced in quantity or withdrawn in the ready and unit share markets.

~~(b) Order quantity cannot be undisclosed in the ready market.~~

(~~c~~b) The bid (offer) can be higher (lower) than the offer (bid).

(~~d~~c) No matching of orders.

(~~e~~d) This phase will end randomly at any time from 08:58 to 08:59 hours.

(3) Non-Cancel Phase (08:58–59 to 09:00 hours)

(a) This phase will begin immediately after the Pre-Open Phase ends, which may be at any time from 08:58 to 08:59 hours.

(aa) No input, amendment and withdrawal of orders.

(b) Orders that can be matched are matched at a single price computed based on an algorithm set by SGX-ST. The computed price will be the opening price for the day.

(c) Unmatched orders are carried forward into the morning trading session.

2.3 Trading Phase

(1) The Trading Phase will be from 09:00 to 17:00 hours.

(2) The Trading Phase allows order entry, reduction in order size and withdrawal of orders. Orders are matched in the order of price priority followed by time priority.

(3) All unmatched orders after the Trading Phase are carried forward to the Closing Routine.

2.4 Adjust Phases

(1) An Adjust Phase operates upon the lifting of a suspension of a security or Futures Contract. A trading halt operates in the same way as an Adjust Phase.

(2) Upon Lifting of a Suspension

(a) The Adjust Phase sets in for 15 minutes. A longer time can be specified.

(b) Orders can be entered, reduced in quantity or withdrawn for the ready and unit share markets.

~~(c) Order quantity can be undisclosed in the ready market (subject to a minimum of 50,000 disclosed quantity).~~

(~~d~~c) The bid (offer) can be higher (lower) than the offer (bid).

(~~e~~d) Orders that can be matched will be matched at the end of the Adjust Phase at a single price computed based on an algorithm set by SGX-ST before normal trading resumes. Unmatched orders at the end of the Adjust Phase are carried forward into the phase of the market applicable when the Adjust Phase ends.

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(~~f~~e) However, this behaviour does not apply when the end of Adjust Phase coincides with the Opening Routine or Closing Routine. In these circumstances, orders entered are carried forward into and matched accordingly in the respective Opening Routine or Closing Routine.

(3) During a Trading Halt

(a) Existing orders remain valid.

(b) Orders can be entered, reduced in quantity or withdrawn in the ready and unit share markets.

~~(c) Order quantity can be undisclosed in the ready market (subject to a minimum of 50,000 disclosed quantity).~~

(~~d~~c) The bid (offer) can be higher (lower) than the offer (bid).

(~~e~~d) Orders that can be matched will be matched at the end of the trading halt at a single price computed based on an algorithm set by SGX-ST.

(~~f~~e) Unmatched orders are carried forward into the phase applicable to the market at the time of lifting of trading halt.

(~~g~~f) If the trading halt is not lifted by the end of a Market Day, all unmatched orders lapse.

2.5 Closing Routine

(1) The Closing Routine is a 6-minute session after trading stops at 17:00 hours for normal day trading, or 12:30 hours for half-day trading. It comprises the Pre-Close Phase and the Non-Cancel Phase.

(2) All unmatched orders are carried forward to the Closing Routine at 17:00 hours (for normal day trading) or 12:30 hours (for half-day trading).

(3) Pre-Close Phase (17:00 to 17:04–05 hours/12:30 to 12:34–35 hours)

(a) Orders can be entered, reduced in quantity or withdrawn in the ready and unit share markets.

~~(b) Order quantity cannot be undisclosed in the ready market.~~

(~~c~~b) The bid (offer) can be higher (lower) than the offer (bid).

(~~d~~c) No matching of orders.

(~~e~~d) This phase will end randomly at any time from 17:04 to 17:05 hours (for normal day trading) or 12:34 to 12:35 (for half-day trading).

(4) Non-Cancel Phase (17:04–05 to 17:06 hours/12:34–35 to 12:36 hours)

(a) This phase will begin immediately after the Pre-Close Phase ends, which may be at any time from 17:04 to 17:05 hours (for normal day trading) or 12:34 to 12:35 (for half-day trading).

(aa) No input, amendment and withdrawal of orders.

(b) Orders that can be matched are matched at a single price computed based on an algorithm set by SGX-ST. The computed price will be the closing price for the day.

(c) All unmatched orders lapse.

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(5) This routine is designed to reduce the risk of manipulating closing prices with a single transaction at an unusually high or low price, just before the trading session ends.

3 Algorithm Used by SGX-ST to Compute the Single Price at Which Orders at the End of the Opening Routine, Closing Routine and Adjust Phase are Matched

3.1 The methodology for computing the single price at which orders at the end of the Opening Routine, Closing Routine and Adjust Phase are matched ("Equilibrium Price") is as follows[1]:—

(1) The Equilibrium Price is the price that has the largest tradable volume and the lowest imbalance. "Imbalance" refers to the net difference between the cumulative bid volume and cumulative ask volume. See Example 1.

Example 1

Bid Volume	Price	Ask Volume	Cumulative Bid Volume (a)	Cumulative Ask Volume (b)	Tradable Volume	Imbalance (a)-(b)	Pressure
0	3.750	10	340	10	10	330	Buy
0	3.760	20	340	30	30	310	Buy
50	3.770	50	340	80	80	260	Buy
100	3.780	80	290	160	160	130	Buy
70	3.790	30	190	190	190	0	Nil
30	3.800	40	120	230	120	70	Sell
90	3.810	20	90	250	90	160	Sell

In this example, the Equilibrium Price is $3.790 where the tradable volume is the largest and the imbalance is the lowest. If the highest tradable volume occurs at more than one price the algorithm will then consider imbalance, see sub-paragraph (2).

(2) If the highest tradable volume occurs at more than one price the Equilibrium Price is the price with the lowest imbalance. See Example 2.

Example 2

In this example, the Equilibrium Price is $3.790 where the tradable volume is the largest (190) and the imbalance is the lowest (20).

If market orders are present a situation may arise in which the lowest imbalance occurs at "Market Price", see sub-paragraph (2A).

If the highest tradable volume and lowest imbalance occur at more than one price the algorithm will then consider market pressure, see sub-paragraph (3).

(2A) If market orders are present and the market order volume on one side exceeds the cumulative order volume on the opposite side there would be a Market Order Surplus. This means that the lowest imbalance occurs at "Market Price". In this situation, one tick will be added on the side with the Market Order Surplus and that would be the Equilibrium Price. See Example 2A.

Example 2A

Bid Volume	Price	Ask Volume	Cumulative Bid Volume (a)	Cumulative Ask Volume (b)	Tradable Volume	Imbalance (a)-(b)	Pressure
	MKT		50	0			
	3.750	10	50	10	10	40	Buy
	3.760		50	10	10	40	Buy

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Blue underlined – new rules

	3.770	10	50	20	20	30	Buy
10	3.780		50	20	20	30	Buy
	3.790		40	20	20	20	Buy
10	3.800		40	20	20	20	Buy
	3.810		30	20	20	10	Buy
30	MKT		30	20	20	10	Buy

In this example, the lowest imbalance (10) occurs where market order bid volume (30) exceeds cumulative ask volume (20). One tick has therefore been added on the bid side, and the Equilibrium Price is $3.810.

(3) If the highest tradable volume and lowest imbalance occur at more than one price ("the price overlap") the Equilibrium Price is determined by market pressure:

(a) with only buy pressure within the price overlap, the Equilibrium Price is the highest price within the price overlap, or

(b) with only sell pressure within the price overlap, the Equilibrium Price is the lowest price within the price overlap. See Example 3.

Buy (sell) pressure occurs when the cumulative bid (offer) volume is greater than the cumulative offer (bid) volume at a particular price.

Example 3

Bid Volume	Price	Ask Volume	Cumulative Bid Volume (a)	Cumulative Ask Volume (b)	Tradable Volume	Imbalance (a)-(b)	Pressure
0	3.750	10	260	10	10	250	Buy
0	3.760	20	260	30	30	230	Buy
50	3.770	50	260	80	80	180	Buy
0	3.780	110	210	190	190	20	Buy
90	3.790	0	210	190	190	20	Buy
30	3.800	40	120	230	120	110	Sell
90	3.810	20	90	250	90	160	Sell

In this example there is only buy pressure in price overlap, the Equilibrium Price is $3.790 which is the highest price in the price overlap.

(4) If the highest tradable volume and lowest imbalance occur at more than one price and there is both buy and sell pressure or nil pressure within the price overlap, the Equilibrium Price is:

(a) the price within the price overlap that is the closest to the last traded price, or

(b) where there is no last traded price, the lowest price within the price overlap.

See Example 4.

Example 4

Bid Volume	Price	Ask Volume	Cumulative Bid Volume (a)	Cumulative Ask Volume (b)	Tradable Volume	Imbalance (a)-(b)	Pressure
0	3.750	10	260	10	10	250	Buy
0	3.760	20	260	30	30	230	Buy
50	3.770	50	260	80	80	180	Buy

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0	3.780	130	210	210	210	0	Nil
90	3.790	0	210	210	210	0	Nil
30	3.800	40	120	250	120	130	Sell
90	3.810	20	90	270	90	180	Sell

In this example, assuming that the last traded price was $3.800, the Equilibrium Price is $3.790.

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