



Appendix I: GSEC Sigmasm Basic

Goldman Sachs Execution & Clearing L.P.'s (GSEC) delivers a technologically robust direct access and connectivity solution to the global shares, derivatives and portfolio-trading marketplace.

**FIX Interface Specification
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Electronic Transaction Services

Global Electronic Trading

Multiple Products

Fully Integrated

GSEC SIGMASM - Smart Order Routing for Basic Order Types

Introduction to GSEC SIGMASM

SIGMA is GSEC's smart router that has been designed to simplify trading in an environment where competing marketplaces have fragmented liquidity. SIGMA leverages technology to consolidate access to all major pools of liquidity. The goal is to condense different trading styles into algorithms (price types), which could be used to improve execution quality in terms of speed, price, impact or benchmarking. When an order is submitted to the smart order router using one of several algorithms, the router determines how to manage the order across destinations and how to best access the pool of liquidity to meet the trading objective. Each algorithm has been customized based on security type (Listed, OTC, ETF), market session and client privileges. Clients can access this functionality either through the REDIPlus front end or the FIX API.

Routing to SIGMASM

This can be done in one of two ways:

1. Default can be set to route directly to SIGMASM for Listed stocks, OTC stocks or both- This allows clients to route to SIGMASM without any development.
2. Default can be set to "None", after which the SIGMASM tag (Tag 11007) must be set for the order to be sent to the SIGMA router.

Restrictions

- Orders can be sent to SuperMontage to be posted with the SIZE MPID before 8am, but will not be posted until 9:30am. They cannot be sent to SIZE after 4pm.
- ETFs (SPY, DIA & QQQ) sent before 9:30am are posted to InstinetTM and after 9:30am, they are posted to ArcaExSM.
- Listed orders are sent by default to Instinet before 9:30am, to NYSE/AMEX between 9:30am and 4pm, and to ArcaExSM after 4pm. This feature is configurable. **

Entitlements

- Must be entitled for SMART order types.
- Auto-Refresh - allows existing orders to be cancelled when there are locked/crossed markets, and then routed to the market which is locking/crossing for execution.
- Average Price Configuration, which by default is turned off. Can be set to Average Price by Account or Average Price by Exchange.

Extended Hours

- SIGMASM orders can be sent with an Extended Hours TIF. By default, all SIGMA orders are submitted as day orders. However, if the TradingSessionID tag is included with a value of 2 (Tag 336 = 2), then the order will remain open through the extended hours sessions unless the TIF is changed or the order is filled.
- Please note that this is NOT 4pm EST, but rather 8pm EST.

GSEC SIGMASM Basic Order Types

* FIX sessions can be defaulted to either OTC or listed using SIGMASM, and would therefore not require setting Tag 11007.

** Notes about the use of ExDest tag 100 on non-marketable orders: The customer has the option of sending the Exchange Destination tag. This will be used to determine on which exchange a non-workable order will post. When the ExDest tag is not provided, SIGMASM can default the posting destination to any of the values given as Execution Destinations. To configure the default for OTC and Listed symbols, please contact your account representative.

Order Type	Required Tags & Values	Exchange Destination	Definitions & Explanations
Smart Market	SIGMA SM Order: 11007 = 1 Order Type: 40 = 1	SIGMA SM Router	Execute the order to buy or sell a stock immediately at the best available current price. SIGMA scans the consolidated NBBO and applies the proprietary algorithm to decide how the order should be split and which destinations offer the highest probability of execution at the NBBO. The order is then split up and portions of it are routed to those destinations. Certain eligible orders are routed to destinations to seek price improvement and hidden liquidity simultaneously to improve execution quality. The leaves quantity is reworked at through the same cycle scanning the new NBBO until the order is filled.
Smart Limit	SIGMA SM Order: 11007 = 1 Order Type: 40 = 2	SIGMA SM Router *	This algorithm works the same as the Smart Market except that it has a Limit price protection. The algorithm will not breach the Limit price and on reaching the limit price will post the balance of the order either on the default destination (can be changed by the user) or the user-specified destination at time of order entry (for OTC securities only). The posted orders can be entered with destination-supported modifiers like SIZE (for SuperMontage only); Discretion (ECNs and ARCAX); Reserve (all electronic destinations). These orders can be monitored via the Auto-Refresh functionality allowing us to constantly scan the markets for executions in case of locked/crossed markets (adjusting for discretion). Users can use this algorithm with an IOC time-in-force modifier to keep price protection but eliminate posting on any destination. The orders would work the NBBO for the marketable portion and the non-marketable portion would ping the spread for hidden liquidity (discretionary orders) before canceling the order.
Smart Limit IOC	SIGMA SM Order: 11007 = 1 Order Type: 40 = 2 Time In Force: 59 = 3	SIGMA SM Router *	These orders do not post the non-marketable portion of the Limit Orders. They hit the different destinations and even go to a few cents into the spread before canceling out.
IXP Trigger	TIF: 59=X or User Defined XPR: 9426=Y Order Type: 40=3 or 4	NYSE	An order, which must be for at least 15,000 shares, which is triggered when the NYSE indicates an IXP (Institutional Express) condition. The order is held by SIGMA until the stock becomes IXP eligible; the order is then automatically routed to the NYSE as an IXP order with an XPR (NYSE's IOC) time in force. The limit price and quantity is modified if the NYSE quote condition has a lower price and size. If the balance remains above 15,000 shares, the order is held by SIGMA until the next IXP condition appears. This cycle continues until the order is filled, canceled by user or below 15,000 shares. The automation of this "stop order" allows users to enter large blocks without revealing size to the exchange and benefit from IXP (guaranteed auto executions) conditions in the minimum amount of time. All orders are required to have Limit Price protection.

Order Type	Required Tags & Values	Exchange Destination	Definitions & Explanations
OTC Stop	Order Type: 40 = 3	SIGMA SM router, ARCA, INCA, BRUT, ISLD, SuperMontage, BTRD; otherwise, routed to an ECN or the exchange selected	An order that is held within the system until the designated stop price is reached, at which point the order is triggered/elected and becomes a Live Market Order . Election is triggered off the NBBO—buy stops when offered at the stop price and sell stops when bidding at the stop price. Stop orders will work only during regular market hours, 9:30 –4:00.
OTC Stop Limit	Order Type: 40 = 4 Price: 44 = \$\$.\$¢ StopPx: 99 = \$\$.\$¢	SIGMA SM router, ARCA, INCA, BRUT, ISLD, SuperMontage, BTRD; otherwise, routed to an ECN or the exchange selected	An order that is held within the system until the designated stop price is reached, at which point the order is triggered/elected and becomes a Smart Limit Order . Election is triggered off the NBBO— a buy stops when offered at the stop price and a sell stops when bidding at the stop price.
Sweep	SIGMA SM Order: 11007 = 1 Order Type: 40 = S		SIGMA SM executes up/down to the entered limit price, emphasizing speed. SIGMA SM scans the NBBO and depth of all major destinations - SIGMA SM selects destinations whose quoted prices fall within the limit range. SIGMA SM simultaneously routes child orders to the destinations it has selected – orders are sent limit IOC for the posted quantity at the sweep level (defined as 5 cents away from the best bid/offer, a default which can be changed by the user). Destinations can price improve, but because child orders are sent at the sweep limit price, executions can occur at the NBBO. SIGMA SM will repeat this process of scanning and sweeping until the order is filled or cancelled, or until the limit price is reached – unexecuted balance is posted at the limit price to the default or chosen posting destination.