

## Understanding GIB Bid Descriptions

### Hand features

GIB internally describes hands using the following features:

- High card points, using 4321 count
- Total points = HCP + short-suit points (void=3, singleton=2, doubleton=1 – subtract 1 for each short suit with HCP)
- Length of each suit
- **Quality** of each suit
- Total losers
- **Stoppers** in each suit
- **High honors** shown or denied in each suit

### Suit Quality

#### **3-card**

exactly 3 cards

#### **4-card**

exactly 4 cards

#### **biddable**

5+ cards, or 4 cards + 3 of 5 honors or Ace or King

#### **rebiddable**

biddable + 1 card

#### **twice rebiddable**

rebiddable + 1 card

#### **strong rebiddable**

twice rebiddable with 4 of 5 honors or AKQ

#### **solid 6-card**

AKQTxx or AKQJxx

#### **solid 7-card**

AKQxxxx

#### **solid 8-card**

AKJxxxxx or AKxxxxxxx or better

A suit gets the highest quality that describes it.

### Stoppers

#### **unstopped**

none of the below holdings

#### **partial stop**

length+HCP = 4 (Qx or Jxx)

#### **likely stop**

length+HCP at least 5 (Kx or Qxx)

### stop

A, QJx, 5+ HCP, or length+HCP at least 7

### two stops

length+HCP at least 8

## Honors

Cue bids, responses to Blackwood, and some other bids (e.g. help suit game tries) indicate or deny various combinations of honors in a suit. GIB explains this by stating the minimum honor holding it can have and/or the honors that it has denied. For instance, if it's cue bidding and bypasses 4♣ to bid 5♦, it will say **♦A, no ♣A**.

When it shows some honor combination, it could be better. GIB uses an **8-4-2-1** system to calculate the value of honors: Ace = 8, King = 4, Queen = 2, Jack = 1. If it says that it has KQ of a suit, that's 4+2 = 6, but this is the minimum; it could have the Ace instead, since that's worth 8 by itself. This is somewhat like the old "quick tricks" evaluation of honor combinations (A and KQ are both considered 1 quick trick).

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## How these features are used

These features are used in bidding rules in two ways:

1. Does the hand the robot holds, plus what other players have shown, fit the requirements for the bid? This is the *criteria*.
2. What type of hands does the bid show? We call this the *specification*.

You might expect that these would be the same thing (if it requires a 5-card suit, it must also show 5+), but that's not always the case. For example, Stayman can be used with a variety of hands, so it doesn't show anything specific. And when the criteria incorporate what partner has already shown, it's difficult for the software to infer the specification from this, so we need to enter it explicitly.

When you mouse over a bid in a robot game, the description is produced from the specifications of all the rules that fit the auction and produce that bid.

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## Descriptions from multiple rules

Sometimes two bidding rules will result in the same bid. For instance, if your partner opens a weak 2, you would raise to game with a weak hand and 4-card

support (raising the preempt based on the Law of Total Tricks), or with a strong hand and 2-card support (because you think you can make it). When combining rules like this, we use the minimum of each feature shown.

In the above example, the rule for the weak hand shows **total points = 4+, length = 4+**, while the rule for the strong hand shows **total points = 16+, length = 2+**. GIB is not able to describe a hand as showing "*this or that*", so it shows the least common denominator of each feature: **4+ total points, 2+ cards**. This means that the hand has at least 4 points and at least 2-card support, although it can't have the minimum of both at the same time. Unfortunately, there's no way for you to tell that this is what it means.

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### Descriptions from multiple bids

When a player has made multiple bids in the auction, each of them contributes a specification. These are combined by taking the maximum of each feature. So if a player makes a bid that shows 5+ hearts, and later makes a bid that only shows 4, we will still display that he has shown 5+.

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### Descriptions containing related features

Sometimes you'll see a confusing description like **5+ ♦, 3-card ♦**. How can it be both a 3-card suit and have 5+ cards, you ask. This is because these are two different features: **5+** comes from the **Length** feature, while **3-card** comes from the **Quality** feature. Although these are related (a 5-card suit is always at least biddable), GIB doesn't take these relationships into account when describing the hand. If one bid only shows suit length, while another bid only shows suit quality, the final description will show each of these as they were shown by their respective bids. As mentioned above, we maximize each feature across multiple bids that show that feature, but we don't reconcile different features, even if they're related.

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### Why doesn't the robot's hand always match the description?

When humans play bridge, they don't just follow rote rules for bidding; they often use their judgement to find better bids, or fill in holes in their system. We would love it if we could program judgement into GIB, but that would be pretty advanced artificial intelligence. As with many game-playing computer programs (e.g. chess programs that routinely beat grandmasters), we substitute brute computational power for thinking. Many of GIB's rules allow it to perform *simulations*.

GIB starts by finding the matching bid in its bidding rules (we call this the "book bid"). If simulations are allowed, it then makes some adjustments to its hand

(adding a card to each suit, adding/subtracting a few total points) and finds the book bids for those similar hands. Then it deals out cards to the other hands at the table consistent with the rest of the auction. For each hand and possible bid, it does 2 things:

1. Determine how the auction will probably continue if it makes that bid (to avoid exponential complexity, it only considers book bids for this continuation, not what would happen with subsequent simulations), and
2. Calculate the double-dummy result of the final contract determined in step 1.

It then selects the bid whose expected value is highest across all the hands. This takes into account the form of scoring; this is how we emulate rules of thumb like "bid games more aggressively when vulnerable at IMPs". The description that's displayed comes from the specifications of the bid that was chosen; this corresponds to the standard rule about disclosure in bridge: you must describe your *agreements*, not your actual hand.

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